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The 19 papers presented at Wake Forest University's 1996 Annual Research Forum (Winston-Salem, North Carolina) are as follows: "Initiating and Facilitating Discourse: An Examination of Methods of Four Secondary English Classrooms" (Stella Katherine Beale); "Cheating: Beliefs and Habits" (William Clark); "English Instructional Methods and the Effect on Student Literature Study" (Stuart Alan Egan); "Teaching with the History of Mathematics" (Carol Beth Findley); "Grammatically Speaking: Understanding the Errors of Basic Writers" (Katherine Elizabeth Fisher); "Technology in the Mathematics Classroom" (Tucker D. Grace); "Literature: Teacher's Purpose of Instruction" (Brad S. Hayn); "What Do You Want to Be When You Grow Up?" (Nikki Honeycutt); "Women and Girls in the Single-Sex Social Studies Classroom" (Lori A. Kalisz); "Teachers' Expectations: Implicit and Explicit Communication in the Classroom" (Ashley Martin); "Student Participation in the Science Classroom: A Gender Issue" (Meredith K. McCullough); "What Kinds of Questions Do Teachers Ask in the Classroom and How Do Students Respond?" (Peter Milner); "Gender-Stereotypical Behaviors in High School Classrooms" (Melynda Ray-McCutcheon); "How Do Teachers Customize Their Motivational Strategies?" (Eileen M. Rohmer); "Problem-Based Learning and Student Ability Level" (Ryan Stattenfield); "The Effect of Teacher Prompts on Gender and Comprehension" (Olivia Michelle Utley); "Using the Weather Channel as a Teaching Tool for Geography" (Heather Sherae Wable); "Learning Style Perceptual Strengths in the Mathematics Classroom" (Laurie Walton); and "Exploration of Student Knowledge of Ethical Issues in Genetics" (Aaron Sidscott Wever). (Papers contain references.) (SM)

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1996 Research Digest

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Studies in Teaching
1996 Research Digest

Research Projects
Presented at
Annual Research Forum
Wake Forest University
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Edited by
Leah P. McCoy

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Initiating and Facilitating Discourse:
An Examination of Methods in Four Secondary English Classrooms

by
Stella Katherine Beale

with
Carolyn Matthews, Ph.D.

Wake Forest University
Department of Education
December, 1995

Introduction

The initiation and facilitation of discussion are complex processes which cannot be reduced to simple formulae. Though repeated studies have shown that "learning takes place through social interaction, particularly through language" (Greenleaf & Freedman, 1993, p. 466), and Pinnell and Jaggar (1991) assert that "teachers at all levels must create classroom environments, and interact with students in ways that will help them to develop and effectively use oral language as a tool for communicating and learning" (1991, p. 691), the average American high school is still characterized by "silent work by individual students isolated from each other at solitary desks (Milner & Milner, 1993, p. 46). A reason for this silence may be revealed in a comment by Teacher B: "Discussion is important, but difficult."

In an attempt to de-mystify the processes through which discussion is initiated and facilitated in the secondary English classroom, this paper traces key themes and patterns in four such classrooms. I examine not simply the presence (or absence) of classroom discourse, but also the ways in which four English teachers at a mid-sized Southern high school develop and sustain discussion. As this study is ethnographic in nature, fieldnote excerpts reveal the frequency of discussion in each of these classes, as well as demonstrate the ways in which these teachers 1) implement the use of formal and informal/spontaneous discussion prompts, 2) relinquish or tighten their control in the classroom for the purposes of sustaining discussion and 3) use response as a means of facilitating discussion.

Review of the Literature

A review of the literature reveals that traditionally, classroom discourse has been studied from three basic perspectives: 1) via coding systems (The American tradition), 2) through the recognition of the role of oral language (The British Tradition), and 3) by utilizing an ethnographic perspective which calls for the blending of techniques from various disciplines including anthropology, sociology, linguistics and socio-linguistics (Pinnell & Jaggar, 1991, p. 702 -705).

The most recent and perhaps, the most influential line of research "sprang from theories of classroom discourse emerging in the fields of educational sociology, linguistics, sociolinguistics, and anthropology" (Pinnell & Jaggar, 1991, p. 704). Techniques and theories from a wide range of scholarly fields have merged in this tradition which essentially combines and elaborates on the best practices from both the American and British traditions. Major participants and researchers in this tradition include Cazden, John & Hymes (1972), Edwards & Westgate (1994), and Tuyay, Jennings & Dixon (1995).

The implications of this large body of research are powerful. Generally, regardless of technique, heuristic device, or coding system, the pertinent research surrounding the use of discourse in the classroom emphatically suggests the answer to the question: Should speaking and listening be taught in school? --to be yes, that "all teachers at all levels must create classroom environments, and interact with students in ways that will help them to develop and effectively use oral language as a tool for communication and learning" (Pinnell & Jaggar, 1991, p.691).

Despite this overwhelming theoretical and practical support for classroom discourse, Arthur N. Applebee concluded his 1981 NCTE study of ninth and eleventh grade classrooms with the following disturbing observations: "discussion . . . was rare; it usually took the form of teacher questions prompting brief student response" (1981, p. 102). Similarly, John Goodlad found in his 1984 survey that, "the typical high school classroom is organized around either a teacher before a whole class lecturing/explaining, or students at their desks working on individual assignments" (Goodlad, 1984, qtd. in Milner & Milner, 1993, p. 47).

Recently there has been an increased interest in the "variety of communicative approaches" utilized in the classroom (Burbules, 1993, p.110). Researchers including Green & Wallat (1981), Dillon (1988), and Burbules (1993) have examined and explored issues such as questioning, mapped instructional conversations using the techniques of sociolinguistics, and coded dialogue and discussion in an attempt to create "models of discussion" (Roby qtd. in Dillon, 1988, p.163). Given the well established benefits of oral expression and interaction in the classroom environment, further purposive and qualitative studies are necessary to acquire not only an in-depth understanding of the mechanisms of facilitating discourse in the classroom and the ways in which such dialogical relations can contribute to teaching and learning activities, but also as a means for understanding why such mechanisms fail.

Methodology

My field work was carried out in a mid-sized high school in central North Carolina. Participating in the study were four secondary English teachers and their classes. Specifically, I observed (as a non-participant) 40 hours of classroom teaching, ten hours per teacher. For purposes of anonymity I have chosen refer to the teachers as A, B, C, and D. During each class, I measured the percentage of time given to discussion and took extensive field notes; approximately one-third of each teacher's classes were audio recorded. I also conducted a scheduled interview with each teacher.

During the interview I shared with each teacher the nature of my research, as well as some tentative analyses of his/her class. I asked the teachers, through a series of open-ended questions, to reflect on discussion in their respective classrooms.

Discussion and Implications

Through detailed analyses of discussion excerpts (either from audio tape transcriptions or field notes) this study examines two methods the four teachers I observed used to initiate discussion, and two methods they used to facilitate discussion. The research also explores the possible connections between the type of prompt or facilitation technique, and the relative success or failure of the ensuing discussion. Within the category of initiation, several forms of formal and informal prompts were observed. I observed and analyzed such formal prompting techniques as : questioning and prepared discussion topics, and informal methods including the formulation of discussion from an exterior, unexpected event. The second section of discussion centers around methods of facilitation. In this section the methods of continuing or sustaining discussion including the manipulation of teacher control and response are examined. This research was motivated by several questions. 1) What makes discussion happen in these secondary English classrooms? and 2) Are there certain techniques which insure successful (or unsuccessful) discourse? The following is a summary of my key findings.

Formal Prompts

1. All four teachers I observed utilized formal methods of initiating discussion. The most popular, or most frequently employed method was that of questioning. In many cases, the use of questioning led to a rather unsuccessful form of discussion --recitation.

There were, however, exceptions, including the "Round Table Discussion" observed in Teacher D's classroom. Other formal prompts, including the setting forth of an analogy in Teacher B's class, initiated discussions of varying degrees of success. With these other types of formal prompts, no definitive connection could be made between the method of initiation and the success, failure or type of discussion that followed.

Informal Prompts

2. The use of informal prompts was a second method of initiation I observed in each teacher's class. While a favorite method of initiation in Teacher A's class, no conclusive connection could be made, between the use of informal prompts and the type or success of discussion.

Manipulation of Teacher Control

3. The manipulation of control as a mechanism for furthering or stifling discussion was a method employed either consciously or unconsciously by each of the four teachers I studied. Most of Teacher A's classes featured a low-control type of facilitation, which resulted in flourishing, student-centered discourse. This result was not indicative of the results of low-control facilitation in the classrooms of Teachers B, C and D. Teacher B most frequently facilitated a highly structured, teacher-controlled sort of discussion /recitation. And often, The control techniques employed by Teacher B were extreme enough to completely squelch discussion. Teacher D's classroom was also observed to be highly structured and tightly controlled; while she never completely silenced her class through control techniques, Teacher D's students were observed to have trouble adjusting and participating when involved in more loosely-controlled discussion. Finally, Teacher C's class was observed having difficulty with both highly controlled and loosely controlled facilitation techniques.

Response

4. The final method of teacher facilitation of discussion I observed was that of response. Even a cursory examination of this technique reveals that teacher responses within discussion have the power to either extend or end classroom discussion. Teacher A's frequent usage of noises of approval as well as his generally positive responses to students' comments within the body of a discussion usually led to the continuation of an already successful discussion. Teacher D's frequent requests, in the midst of discussion, for students to "help [her]" or their classmates, also served to facilitate further comments from the class. On the other hand, Teacher B's frequent negative or derogatory comments, often directly attacking the apathy or lack of enthusiasm of the class toward a particular topic of discussion, usually served to facilitate the further break-down of dialogue in his classroom. Teacher C's responses were usually in keeping with her

chosen form of discussion --recitation. Her responses, as is typically in recitation, usually restated a student's answer (to a previous question) and then posed a second question which elicited some further response from the class.

In their text, Bridging English, Milner & Milner (1993), reveal that "in the United States, English teachers and researchers are only just beginning to formulate . . . general instructional principles " (1991, p. 47) concerning how to orchestrate discussion oriented classes and how to create an environment create an environment conducive to talking and listening. In examining methods and patterns if initiating and facilitating discussion, my aim was not to propose or to prove that certain of these methods and patterns are inherently better than others, but rather to examine what is happening in the discussions of these four particular classrooms. My hope for this study is that it may hold some practical implications for the instruction in these classrooms and that it may inspire future, more thorough and inclusive and conclusive studies of the inner-workings of classroom discussion.

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Cheating: Beliefs and Habits

by
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with
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Department of Education
December, 1996

Introduction

The purpose of this study is to see how prevalent cheating is in high schools today. It is also the aim of the researcher to gain insight into what motivates students to cheat and to explore what they do and do not consider cheating. A final goal of the study is to discover if gender or level of course (honors or regular) plays a role in cheating.

Review of Literature

Over the last twenty-five years, cheating has become more of a problem in high schools. Evidence of this academic dishonesty was found in a study published by Schab in 1991 that surveyed high school students on their cheating habits in 1969, 1979, and 1989. In this study Schab found that the number of students who used a cheat sheet on a test had increased 34% over the twenty year period. Also, 39.2% more students let other students copy their work in 1989 than in 1969. The numbers have become more discouraging in the last decade. In 1983, 70% of students surveyed said they had cheated; whereas in 1994, the number had risen to 78% (Who, 1995). In research by Mouritzen (1992), it was discovered that 86% of students questioned had copied a classmate's homework assignment, and 72% had copied a classmate's test.

Research has uncovered interesting attitudes of students towards cheating. There are some students who know it is wrong to cheat but still cheat anyway. In one study (Lickona, 1991), the vast majority of the students rated various kinds of academic dishonesty to be wrong, but over 50% of these students said they would cheat on a test if they were sure they would not get caught. In another study (Mouritzen, 1992), 53% of the sample said that it was wrong to let a friend copy homework, yet 91% admitted to allowing a friend to copy their homework. There is an obvious discrepancy between what students say is right and what they actually do.

Students are cheating for a variety of reasons: they are afraid of failure, they do not want to put forth the effort it would take to be prepared for class, they have very demanding parents, they have intense competition from other students, and they believe cheating is easy (Schab, 1991). Amount and difficulty of material covered, whether course is required, and competition for grades also have an effect on student cheating (Evans & Craig, 1990). The purpose of this study is to reexamine cheating in high schools and to further examine reasons that compel students to cheat.

Methodology

The subjects in this study were students at Reynolds High School. Eight math classes, four honors and four regular were selected for the study. The honors classes consisted of 88 students (42 females, 25 males, and 21 unknown people who failed to identify their gender on the questionnaire). The four honors classes were: Algebra II, Geometry, and two Pre-Calculus. The regular classes contained 89 students (43 females, 33 males, and 13 unknown). The regular classes were: Geometry, Algebra II, and two Algebra I.

The eight classes were administered a questionnaire by the researcher. To emphasize the confidentiality of this questionnaire, no names were written on the form and no one but the researcher looked at the completed questionnaire. The researcher explained the nature of the study and emphasized the importance of them responding with accurate information.

The questionnaire has three sections: one set of eight yes-no questions that measures the student's cheating habits, one set of nine questions that measures the student's cheating beliefs, and the final part that consists of four multiple-choice questions. The analysis for the first set of questions is done by rating the student on a scale from zero to eight based on the number of yes answers given to various "Have you ever" questions about cheating. Similarly, the second set of questions rates the student from zero to nine based on the number of yes responses to "In your opinion, is it wrong to" questions, which are intended to measure the student's cheating beliefs. The multiple choice questions are analyzed separately, conveying still more information about the student's cheating habits and beliefs.

Results and Discussion

The average number of yes answers under the cheating habits section for a female student in a regular class as shown in table 1 was 3.512 and in an honors class was 3.357. The mean score was 3.970 for males in a regular math class and 3.320 for males in an honors class. For the unknown classification, the mean scores were 3.385 and 3.619, respectively. The analysis of variance shows that the differences in cheating habits when compared by gender, level, and the interaction of gender and level are not significant differences. Even though the various groups' cheating habits are not statistically different, that does not mean students are not cheating. The mean score on the cheating habits section was 3.537 for all students who completed the questionnaire. In other words, on the average students have at least cheated in three different ways, and research shows that if a student cheats once, they are more likely to cheat again (Davis & Ludvigson, 1995).

Table 1. Mean Cheating Habits

	Level	
Gender	Regular	Honors
Female	3.512 (sd=1.869)	3.357 (sd=1.694)
Male	3.970 (sd=2.243)	3.320 (sd=1.749)
Unknown	3.385 (sd=1.387)	3.619 (sd=1.465)

Main effect for Gender F(2,171)=.230, p=.795
Main effect for Level F(1,171)=.406, p=.525
Interaction of Gender and Level F(2,171)=.658, p=.519

The average number of yes answers under the cheating beliefs section (table 2) for a female student in a regular class was 5.791 and in an honors class was 7.167. The mean score was 5.727 for males in a regular math class and 5.920 for males in an honors class. For the unknown classification, the mean scores were 5.154 and 7.048, respectively. The analysis of variance shows that the differences in cheating beliefs when compared by gender and the interaction of gender and level are not significant differences, yet the difference between the mean scores of the two levels, honors and regular is a significant difference. Since students in honors classes have stronger beliefs against cheating than students in regular classes, they should cheat less. The results show otherwise, the twc groups' (honor and regular) cheating habits are statistically the same. Similar to previous research (Lickona, 1991), there exists a discrepancy between what students believe is wrong and what they actually do.

Table 2. Mean Cheating Beliefs

	Level	
Gender	Regular	Honors
Female	5.791 (sd=2.386)	7.167 (sd=1.937)
Male	5.727 (sd=2.853)	5.920 (sd=2.597)
Unknown	5.154 (sd=2.824)	7.048 (sd=2.061)

Main effect for Gender F(2,171)=1.285, p=.279
Main effect for Level F(1, 171)=8.509, p=.004 (significant)
Interaction of Gender and Level F(2, 171)=1.577, p=.209

48% of the students surveyed believed many people in their school cheat; whereas, only 1% of the students thought none of the students cheat. 58 students reported not cheating any this current school year. 9 reported cheating 1-2 times, 88 students reported 3-5 times, and 20 confessed to cheating 5+ times this school year. Simply stated, there are more students who are cheating than there are who are not cheating.

Students had cheated in or believed that it was easiest to cheat in foreign language, followed closely by science and history. When asked about their reasons for cheating, fear of failure was the most common response, followed by pressure from parents to succeed and "it takes too much effort to be prepared." These findings are similar to previous research conducted by Schab in 1991. Students also cheated because they forgot about tests, did not have enough time to study, and one student thought it was fun to cheat.

This research has a few limitations. First, when students are asked to complete a questionnaire, there is always some self-report error. Another problem with this self-report is that the students are ironically asked to be honest about their academic dishonesty. Even with these limitations considered, it is obvious from this research that cheating is very much a problem in today's schools. Whether students believe it or not that it is wrong to cheat, they are still cheating. They receive pressure from their parents, fellow students, and other outside sources to do well. This pressure manifests a fear of failure, which drives too many students to cheat in an attempt to be successful in school.

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English Instructional Methods and the Effect on Student Literature Study

by
Stuart Alan Egan
with
Dr. Carolyn Mathews
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Department of Education
December, 1996

INTRODUCTION

As a potential secondary level English teacher, I am intrigued with the methods of instruction used by teachers to motivate high school students to read. Today's student body is steadily evolving, both ethnically and socioeconomically; however, research shows that the canon of literature investigated in high schools has remained somewhat constant. Additionally, today's students are exposed to a greater number of technological innovations and tools to aid them in their studies. In many instances, students may actually substitute these modern conveniences for their own critical and analytical skills in order to pass a class. One such example is the use of Cliff's Notes in lieu of reading literature for English classes.

The purpose of this research study is to examine the methods of instruction that English teachers employ to ensure that high school students are actively reading assigned literary texts and to judge the effects of those methods on students. This study will also attempt to identify student attitudes towards the study of literature and its relevance to their adult lives. Special consideration will be placed on the use of quizzes by teachers.

I feel that the results of this study will enable future teachers to identify methods of positive instruction that will motivate students to read and respond to literature.

REVIEW OF LITERATURE

The use of Cliffs' Notes and other study aids may indicate the declining interest that students have towards the literature that is taught and reviewed in the high school

English class. While efforts are being made to encourage students to actively read literature, many students still rely heavily on study aids rather than primary literary texts to pass English courses (Karsten, 1989). Harvey (1987) suggests that the use of study aids, such as Cliff's Notes, indicates society's less stringent attitude towards performance.

Applebee and Squire comment within their book High School English Instruction Today (1968) that teachers and schools are perpetuating the apathy found in students concerning the reading of literature. They report that some efforts to help generate student reading appreciation have shown success; however, the use of objective, factual quizzes on assigned texts can offset any progress made through classroom discussion. Goodlad (1984) also identifies quizzes as a major offender in inhibiting students from reading.

Research on the use of quizzes suggests that English teachers should not rely on quizzes to motivate students to read. Instead, researchers urge teachers to incorporate other methods of instruction to combat student apathy. One method that has produced positive results in encouraging students to read literature as the primary text is the use of group discussion and reader response activities.

Smagorinsky and Coppock (1995) investigated the relationship between students, teachers, and texts within the English classroom. Endorsing the "reader-response" approach to instruction, this study also favored the use of more non-traditional means of literature response in the classroom.

J.D. Marshall comments that the "reader-response" movement allows teachers to become more open-minded to students' personal interpretation of literature (1988). Marshall further argues that if students' oral response is limited by the teacher's dominant interpretation, then the written response will also show the same creative constraint.

METHODOLOGY

Subjects

The participants of this study included four secondary school English classes in a small to mid-size high school in North Carolina. Classes were differentiated by ability grouping and/or grade level (**one-9th grade, two-10th grade, one-12th grade**). A total of 71 students participated in the student questionnaire.

Measures/Procedures

All students in the four classes were administered questionnaires concerning reading appreciation and teacher motivation. The four English teachers for the chosen classes were interviewed. The interview questions were designed to determine each teacher's perceptions of student reading behavior. Also, the teachers were asked what methods they used to ensure that their students were reading assigned material.

Additionally, all classes and students were observed for a period of one month (approximately 7 class periods each) and were monitored for how teachers motivated their students to read assigned literary texts and how students reacted to that instruction.

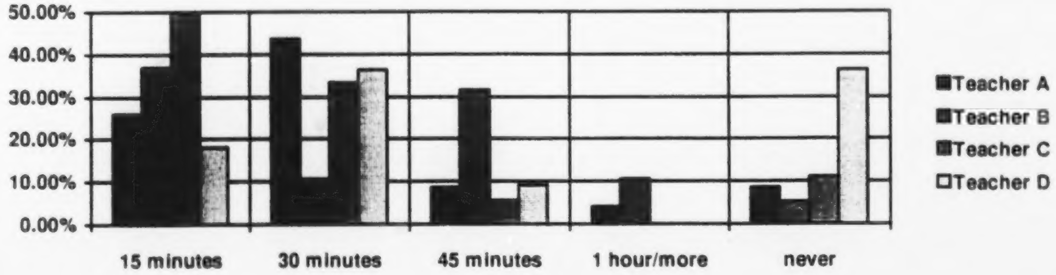
RESULTS

The results of the student questionnaires are as follows:

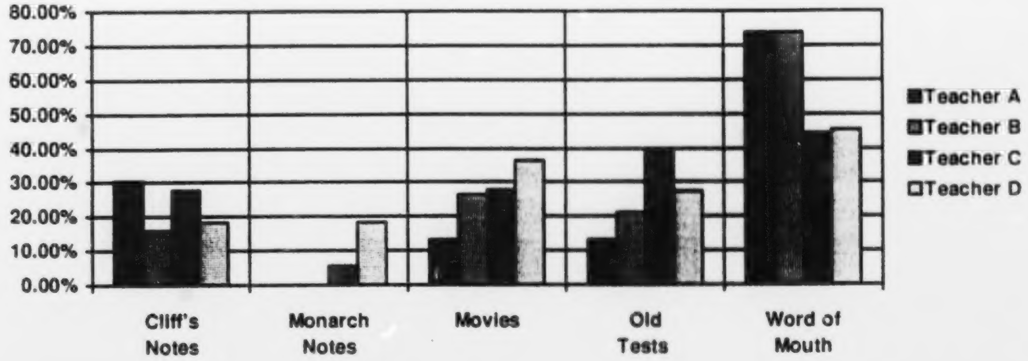
	never	sometimes	frequently	always
Do you enjoy your English class?	2.8%	45.1%	36.6%	15.5%
Do you read assigned texts because of a pop quiz?	7.0%	56.3%	18.3%	18.3%
Do you read assigned texts because of a paper/thesis?	18.3%	47.9%	18.3%	14.1%
Do you feel you are encouraged to read assigned material?	4.2%	18.3%	32.4%	45.1%
Do you feel the assigned reading is worthwhile or purposeful?	14.1%	50.7%	21.1%	14.1%
Does your teacher seem to have a good understanding of the literature?	0.0%	2.8%	21.1%	76.1%
Do you feel that the literature assigned in class is too difficult?	39.4%	46.5%	8.5%	4.2%
Do you feel that the literature assigned in class is applicable to today's society?	11.3%	40.8%	39.4%	7.0%
Do you feel that literature study will help you in your adult life?	18.3%	29.6%	40.8%	11.3%

If you find the assigned readings boring or difficult, do you continue to read and attempt the assignment?	11.3%	35.2%	33.8%	18.3%
Do you use any study aids or methods besides reading the assigned text to help you on tests and papers?	29.6%	46.5%	16.9%	7.0%

How much time daily do you spend completing assigned reading?



What are the most frequently used study aids?



Implications

The results of the research clearly show that Cliff's Notes are not the most frequently used study aid in high school English classes. The benefits of Cliff's Notes may have been counteracted by teachers who design their quizzes and papers to ensure that students have read the material thoroughly.

Students are relying more on "word of mouth" to help them understand the literary texts assigned to them. This means that students are using their peers as sources

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of knowledge and interpretation. This may include other students' notes, class comments, or verbal articulation about the material. Teachers actually encourage this method of learning with extensive use of group activities such as group presentations, "reader response" sessions, and student led discussions.

The "pop" quiz was the most commonly used method of ensuring that students had read the assigned material. Teachers also motivated students to read through the use of humor, classroom discussions, and historical presentations on authors and texts. The study also identified other factors that motivated students to read: fear of bad grades and the threat of not graduating.

Most students stated that they read the assigned material; however, teachers commented that they believed most students are not reading. This data implies that students may begin reading assigned materials, but many do not finish them as the result of boredom, fatigue, or other commitments. In a couple of instances, students remarked to their teachers that they could not read the assignment because of after-school jobs.

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Teaching with the History of Mathematics

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Introduction

Mathematics teachers are often concerned with ways to make math more accessible for their students. Frequently they look for methods to help their students understand math more clearly and enjoy math as well. One such method for enhancing the mathematics curriculum is incorporating the history of math into classroom discussion. The purpose of this study is to develop methods to incorporate the historical development of mathematics into the secondary school curriculum. These historical presentations will attempt to demonstrate the contexts and reasons that led to the development of certain mathematical concepts in order to enhance students' understanding.

Review of Literature

Mathematics educators sporadically during the last century have advocated using the history of mathematics as a teaching device (Hassler, 1929; Jones, 1957; Swetz, 1984). The recent publication of the Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989), however, has brought more attention to the benefits of exploring the history of mathematics in the classroom. Many recent articles delineate a wide spectrum of reasons why teachers should utilize the history of mathematics.

First, explaining the historical background of mathematical concepts can help students understand both the reasoning behind and motivations for these particular concepts. Students often wonder why mathematics works the way it does (Garofalo & Durant, 1991; Toumasis, 1993), and placing an idea in its original context can help them see the mathematician's reasons for developing a concept (Toumasis, 1993).

Second, including the history of mathematics in the classroom provides several ways to enhance students' appreciation for mathematics as well. Most effectively, historical references "humanize" mathematics (Bidwell, 1993, p. 461). Students can associate impersonal symbols, procedures, and formulas with interesting people and situations, adding more imagination and depth to classroom discussion (Swetz, 1984). In addition, exposure to conflicts, struggles, and successes of mathematicians, especially women and minorities, can encourage students to pursue math further (Bidwell, 1993). Since the history of mathematics spans many nations and time periods, it provides the opportunity to learn about other cultures (Bidwell, 1993; Jones, 1957). Mathematical history also offers "real world" applications of math to pupils' lives (Jones, 1957).

Third, incorporating the history of mathematics offers many opportunities to improve teaching methods.For instance, teachers can add creativity to the curriculum through historical anecdotes, applications, demonstrations, and enrichment activities (Bidwell, 1993; Jones, 1989; Toumasis, 1993) In addition, students can develop problem solving skills through investigating significant problems from the history of mathematics (Barbin, 1996; Garofalo & Durant, 1991).

While many educators have discussed these advantages of teaching a curriculum rich in math history, very few have carried out research experiments to test these suggestions. The only quantitative study available was given by McBride and Rollins (1977). Inspired by Jones' (1989) collection of historical topics, these researchers exposed students to historical material infiltrated with the mathematics in their class discussion. Consequently, students who had exposure to the historical information developed more positive attitudes toward mathematics.

Toumasis (1993) demonstrates that teaching a mathematical topic according to its natural development is an effective way to increase students' understanding. Frustrated because he could not answer his students' questions about the derivations and reasonings behind logarithms, Toumasis decided to research the historical development of logarithms and incorporate it into his teaching. Not only did he find that his students understood the concepts more clearly, but they also actively participated in the discussions and developed an intuitive feel for logarithms as well.

With so much attention given by the NCTM Standards (1989) to helping students understand and make connections with mathematics, it is important for students to see meaning in mathematics. Dealing directly with the mathematics and its history addresses the students' lack of understanding by explaining the concepts clearly and concretely. Thus, more attention should be given to developing ways to utilize the historical development in explaining mathematical concepts.

Methodology

A variety of resources on the history of mathematics were surveyed to find anecdotes and examples appropriate for use in secondary schools. Since these sketches would be used to explain mathematical concepts, it was important to select topics associated with elementary mathematics that included memorable stories and straightforward explanations. Five topics were chosen and researched: analytic geometry (Descartes and Fermat), completing the square (Al-Khowarizmi), complex numbers (Cardano and Bombelli), rational and irrational numbers (the Pythagoreans), and summation (Gauss).

Lesson plans were then developed for each of these topics. Each lesson plan consisted mainly of an introduction to the topic based on its history, often involving an anecdote about the mathematician who developed the concept. For example, the lesson on rational and irrational numbers described the secret society of the Pythagoreans and their devotion to number as the basis of the universe. They believed everything could be described by ratios of integers, or "rational" numbers. When $\sqrt{2}$ was discovered, however, they were shocked that "irrational" numbers existed and threatened to throw into the sea any member of their group who revealed this information to the public. This and the other four lessons were designed to introduce a concept and provide prompts for the teacher to fully explain the mathematics involved.

Two of these lessons were then tested in four algebra classes in a public high school in Winston-Salem, NC. The author explained the lesson on rational and irrational numbers to 42 students in Algebra IB and the lesson on complex numbers to 47 students in Honors Algebra II. After the lessons were presented, the students completed a questionnaire that explored their responses to the historical lessons.

Results and Conclusions

The results of the questionnaire show that overall the students benefitted from the historical lesson. Of the 90 students surveyed, 63% indicated they enjoyed the lesson, with only 4% claiming they did not and the remaining 32% having a neutral response. Furthermore, 58% said that the lesson helped them understand the concept better, while 11% disagreed and 31% had no response. A majority of the students reported as well that the lesson helped them see why the concept was developed: 77% agreed with this statement, 4% disagreed, and 19% were neutral.

Many students commented that the lesson was effective because it was "more interesting," "made more sense," and "related . . . to normal everyday life." One student suggested, "When you are taught how something came about and not just why, I feel you get a better understanding of the subject." Another student felt that he or she would be able to remember the concept on a test by remembering the story associated with it. However, several students indicated that the lesson was not meaningful for them because they did not understand the mathematics used in the lesson.

Although many students enjoyed and appreciated the lessons based on history, only 41% of the students indicated they would be interested in learning about how other concepts developed. Twenty-six percent suggested they would not want to learn about other historical concepts, and 33% had neutral responses. Some students indicated that often history did not interest them, and others felt the lesson given was too fragmented to be understood clearly. Perhaps more focused and in-depth lessons given by the teacher in the natural course of class discussion could interest the students more.

As the results of the questionnaires show, using the historical developments of math in conjunction with the explanation of the mathematics itself is extremely important. Students commented that the lessons clarified their understanding, helped them appreciate mathematics, and made class more interesting to them. One student concluded,

> Math history and the thought processes behind how mathematical concepts developed is always more interesting than the actual rote learning system of solving equations, etc., without knowing why we're doing what we're doing. I believe that math would be a lot more interesting if teachers actually took the time to tell us why and explain who thought of a particular concept, how it came about, etc.

Teachers are often encouraged when students indicate interest and understanding in mathematics. This student's comment exemplifies the desire both to understand and enjoy mathematics, and he sees math history as a means to fulfill these desires. Thus, educators should be motivated to incorporate more math history into the secondary school curriculum.

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Grammatically Speaking: Understanding the Errors of Basic Writers

by

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I. Introduction

> For the Basic Writing student, academic writing is a trap, not a way of saying something to someone. The spoken language, looping back and forth between speakers, offering chances for groping and backing up and even hiding, leaving room for the language of hands and faces, of pitch and pauses, is generous and inviting. Next to this rich orchestration, writing is but a line that moves haltingly across the page, exposing as it goes all that the writer doesn't know, then passing into the hands of a stranger who reads it with a lawyer's eyes, searching for flaws (Shaughnessy, 1977, p.7).

For the purpose of this study, I define basic writers as those students who have not yet achieved a working knowledge of grammar as fluency with written language. Through analysis of student's writing samples I can understand the specific types of mistakes students are making and the frequency of those mistakes. I will then attempt to analyze student's errors and how those errors interfere with students written communication. By understanding students' needs teachers can modify their approaches to grammar in order to target those students who are isolated as communicators by their grammar deficiencies. There is a heated debate surrounding the teaching of grammar but Milner and Milner (1993) argue that "[grammar] instruction needs to be pitched where it is most helpful" (p.30). Therefore, it is essential to understand students' needs when developing a plan for grammar instruction in the classroom. "Identifying usage level in important as a means of clarifying your students' actual language skills. It can enable you to enhance your language instruction by directing it to the most serious departures from effective communication." (Milner, 1993, p. 31).

Advocates of new approaches to grammar argue that teaching grammar as an isolated entity does not achieve results. Warner (1993) uses an informal study of English teachers to support her assertion that traditional grammar instruction does not meet the needs of students. She makes observations of her students and colleagues as well. Her conclusion is that teachers spend more than 30% of teaching time on grammar separate from reading, writing, speaking , and listening--the basic skills of language. Renwick (1994) utilizes the work of linguist Erika Lindemann and her theory that "students don't have to understand grammatical principles the way English teachers do in order to be effective speakers and writers." (p.29). Renwick heeds Lindemann's suggestion that "teachers must first examine the types of mistakes students make and then define what elements are causing the problems for students before they can teach students to transfer the rules to their writing"(p. 29). For an entire school year, Renwick observed her students and kept a record of the most common usage mistakes in her students writing. "The top five areas of misuse involved the following:

1. irregular verb forms
2. s, ed, ing endings
3. double negatives
4. pronoun usage
5. homophones (Renwick, 1994, p.29-30)

Renwick (1994) proposes her ideas as to why students are deficient in these areas. One of her explanations for student's misuse of standard language is that "students model the speech of their environments" (p.30). From her student's responses to her queries about their usage, Renwick (1994) is able to generalize that "most people must break usage rules such as those involving verb forms because the rules can be so inconsistent and complicated and often make no sense to them." (p.30) Renwick applies her research to her teaching methods and is able to develop innovative techniques to help students understand grammar in a different way. She also encouraged students to learn to find their own mistakes because "in [her] opinion, a student's ability to recognize a usage error brings as much joy to the job of teaching as does a student who follows all the rules" (Renwick, 1994, p.31).

Mark Lester (1990) develops three assertions about the cause of error for basic writers. Lester (1990) elaborates on these ideas by providing an analysis of the ways in which "written language is a special form of encoding the spoken language" (p.354). He provides explanations for specific errors as they are caused by the inability to make the jump between the written and spoken word. Teachers with an understanding of students' difficulties in this area should emphasize the differences between the two. Lester points out that "obviously, basic writers do not deliberately choose to produce errors...they consciously and unconsciously employ strategies (rules), some of which have errors as side effects" (p.354). He argues that it is counterproductive for teachers to criticize errors with negative feedback because then we are "not meeting [basic writer's] needs for practical, workable, strategies that they can incorporate into their own system" (Lester, 1990, p. 355). Finally, Lester (1990) asserts that "errors are necessary"(p.355). The errors of basic writers are "a necessary byproduct of various stages in the development of an adult-like rule system." (Lester, 1990, p. 355). Lester (1990) makes an analogy to clarify this point, "Consider how counterproductive it would be if we reacted to children's errors in learning to speak in the same way that we react to students' errors in learning to write" (p. 357).

Mina P. Shaughnessy (1977) emphasizes what is implicit in Lester's work; students must write extensively in order to develop from their status as basic writers. In addition, Shaughnessy (1977) contends that

> the errors that [basic writers] make cannot be neatly traced to one particular source, namely, the habitual preference of a vernacular form over a standard form. Instead he/[she] finds evidence of a number of interacting influences: the generally humiliating encounter with school language, which produces ambivalent feelings about mastery, persuading the child on the one hand that he/[she] cannot learn to read and write (p.10).

Shaughnessy (1977) addresses the psychological impacts that writing difficulty can have on the basic writer, "confusion rather than conflict, seem to paralyze the [basic] writer" (p.10). She lauds the teacher who is careful and conscious of the dilemma of the basic writer. Teachers who take the time to reevaluate their systems and the ways in which they define and perceive errors represent the only chance that many basic writers have for success. However, "there is no easy or quick way to undo this damage" (Shaughnessy, 1977, p. 11). By the time basic writers reach their first year of college they have been conditioned by their previous twelve years of education that errors are negative and that they can never be successful writers if they are error-prone in their writing. Shaughnessy (1977) contends, "to try to persuade a student who makes these errors that the problems with his/[her] writing are all on the outside, or that he has no problems, may well be to perpetuate his/[her] confusion and deny him/[her] the ultimate freedom of deciding how and when and where he/[she] will use language (p.11).

In an effort to help basic writers overcome this "damage", Shaughnessy uses her book to develop explanations for the problems that basic writers experience. She also attempts to redefine what an error is

> Errors..are unintentional and unprofitable intrusions upon the consciousness of the reader. They introduce in accidental ways alternative forms in spots where usage has stabilized a particular form. They demand energy without giving any return in meaning; they shift the reader's attention from where he/[she] is going (meaning) to how he/ [she] is getting there (Shaughnessy, 1977, p. 12).

This shift in reader's attention, the error as a communication distracter, is the focus of my analysis of the errors of basic writers.

III. Methodology

The five student subjects profiled in this study were enrolled in Basic Writing 010 in the Fall 1996 at a community college in a medium-sized Southeastern city. All five students graduated in the spring of 1996 from one of the nine high schools in the same city/county as the community college.

This system I have created is based on the recommendations for grammar instruction provided by Milner and Milner (1993) and the observations of Renwick (1994). Students were assessed on ten specific types of grammar errors.

After close examination of the writing samples, I compared students as a whole and individually. I outlined the ways in which students' grammar errors detract from the effectiveness of the communication of their writing. It is important to the accuracy of this portion of the study to note here that errors can only be counted in one category. For instance, although a homophone is technically a spelling error, this would only be counted in the homophone category. However, if the same word is misspelled throughout the student's work a spelling error will be noted for every time the mistake occurs.

IV. Results and Conclusions

Structural ambiguity accounted for 21% of the errors assessed. Unlike spelling, structural ambiguity almost certainly brings communication to a halt. For this reason, although it did not rank as the most frequent error, the frequency of this complex mistake shows a serious difficulty of the basic writer. Sentences that have been labeled structurally ambiguous are those sentences that do not have a clear subject and verb, change focus in such a way that is confusing or unclear, or use words in an unfamiliar pattern that does not assign a specific function to every word in the sentence. Often the structurally ambiguous sentence leaves the reader with a sense that something of the sentence is missing. Consider Participant A's sentence, "I will probaly go to collage for about four or five years studing and having bunches of classes in my carrer"(Appendix D, Sentence 3). Aside from the obvious spelling errors, there is a shift in the structure of the sentence as she/he moves from writing in the future tense about how long the college career will be to present participles which outline what he/she will do once in college. There is no transition between these two ideas and therefore the meaning of the sentence is masked by the way that it is written.

Another area of particular interest to me was that of aural transference. Basic writers tend to be.more comfortable with speech and their writing often reflects their tendency to write words as they sound rather than as they are written. Aural transference made up 7.7% of the total errors. This explanation also applies to homophones. There is no distinction created in the sounds of words such as "to", "two", and "too" or "there" and "their", therefore these words are often confused by basic writers who gain most of their exposure to language through speech. Homophonic errors accounted for 15.4% of student errors.

The charts included in the appendix give the specific percentage for each participant and each category of error. There were a total of 85 errors in the 50 sentences that were submitted by the participants.

V. Implications for Secondary English Education

As I dialogued with teachers about their various philosophies of grammar instruction, I realize that teachers are trying many different approaches and innovative methodologies. The curriculum for the school district takes the emphasis off grammar as students move through high school. The senior English teachers that I talked with had very high expectations of their students with respect to grammar. If a student experiences a difficulty with a particular concept, these teachers recommend page numbers from the grammar book that would be helpful to the student. The student must then take responsibility for his/her own understanding of the material. While the emphasis of this study is that teacher's understand grammar errors, it is equally important that students think about their learning strategies and the nature of their grammar errors. This study provides a limited view of a far reaching issue. Although there has been extensive study in the area of grammar and basic writers, there is still much to be done. There are an alarming number of students who graduate from high school without the basic grammar skills that they need to be successful communicators. The participants in this study are only five but they represent a sizable group. It is crucial to question and evaluate our teaching practices and their effectiveness, just as we evaluate our students' progress. The curriculum leaves teachers the freedom to experiment and use students' needs to develop approaches to grammar instruction.

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Technology in the Mathematics Classroom

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Introduction

In 1989, the National Council of Teachers of Mathematics created the *Standards* document, in which they encourage high school math departments to incorporate computers and calculators as teaching aids. This research will examine the use of computers and calculators in the local public high schools which are representative of high schools across the county. Math department chairs will be interviewed about the amount of time computers, computer software, and calculators are used to aid in math lessons and classes. This study will measure time, availability, and use per math class that Winston-Salem high schools spend working with these technologies. This collected data will be analyzed and measured against the model of reform suggested by the *Standards* document.

Review Of Literature

A study done by Garet and Mills (1995) addressed several questions. "To what extent are schools responding to the Standards document?"(p. 381). They investigated changes in textbooks, student evaluation, and most important the increased use of technology in the math classes. Their results clearly show an increase in the use of computers and especially calculators in the schools they surveyed. The study also showed that changes were made were hastened or facilitated by the department heads.

Dan Kennedy (1995) discovered the effectiveness of the graphing calculator in his math classes. He feels that his students can be exposed to more exciting mathematics by the use of graphing calculators. The graphing calculator allows students to enjoy and appreciate the higher math. "I saw how well they worked with each other with the calculators, so I began to develop ways to make them work together to discover mathematics"(Kennedy, 1995,p. 463).

Methodology

My current research will examine the use of computers and calculators in the public high schools which are representative of high schools across the county. Eight math department chairs will be interviewed about the amount of time computers, computer software, and calculators are used to aid in math lessons and classes. This collected data will be analyzed for similarities to previous research.

The interview will consist of a 26 question questionnaire. The questionnaire has three parts: Background, Computers, and Calculators. The background information will be used as a device for computing results. This data will include the number of teachers in each math department and the math subjects being taught. The computer and calculator section will generate numerical and descriptive data. This information will focus on the number of computers and calculators available for teachers and students, computer and calculator use, teacher knowledge of the technology, and the use by subject. The interview will indicate any increase of technology use within the last 10, 5, and 2 years. The last question asked will generate the most important information. Teachers will be given the opportunity to make recommendations for increasing the amount of technology used in Forsyth County.

Results and Conclusions

The high schools in Forsyth County are using technology. Every school has teachers using computers or calculators as teaching aids in their classes. It is evident that calculators are used more frequently than computers, which is consistent with previous research done by Garet & Mills (1995). Only two out of the eight high schools reported having a math computer lab.

Computer usage has increased in all eight high schools during the last 10 to 5 years and six of the schools reported to have more computer usage now than 2 years ago. Every school in Forsyth county has computers available for math teachers and their students. The research shows that three high schools have 17 or more computers, while the other five high schools have between 4 and 6 computers available for teachers and students. It is apparent that the more computers a school has, especially the schools with a math computer lab, teachers are more apt to use computers as part of their lessons. There are three schools who have computers but do not use them as teaching aids. My research shows that 5 out of 8 school have teachers who use computers as part of their lessons. Very few, though, use computers on a consistent basis and only a small minority use computers at all. Approximately 14%(13 out of 91 math teachers) have used computers as part of their lesson. These teachers on average use computers 2-3 times a semester, one teacher, though, uses computers for their Math 5 class three times a week. It is interesting to note that out of all the classes taught with computers the teachers who taught pre-algebra class used computers more often than any other subject. Higher level math classes used computers less frequently than lower level math classes. Teachers use several different types of computer software: Mathematics Exploration Toolkit, How the West was Won, Green Globs and Graphing Equations, Geometry SuperSuposer, Access and Hyper Studio. This software is used to teach a variety of lessons. A few of these lessons include graphing/graphing relations, factoring functions, finding slope's, quadratic equations, and trigonometry.

Calculator usage has increased in Forsyth County during the last 10 years in every High School and seven out of eight school report increases during the last 2-5 years. Forsyth county high school math teachers like to use calculators. Nearly 100% of the math teachers reported using calculators for teaching aids (89 out of 91 teachers reported using calculators). The most popular types of calculators are graphing, scientific, and four-function. The data shows that calculators are used more often in higher level classes than lower level classes, usually in Alg I/Alg II and above. These classes use calculators nearly everyday. Many teachers would like to use calculators more in their high school math class and algebra I classes but feel their students need to have a firmer grasp on the material before allowing them to use them.

I found that one of the reasons why calculators are used more often than computers is the cost difference. The math chairs suggested that if computers and computer software were less expensive then the schools might invest money into them. They also stated that calculators are easier to use and are available to every student and teacher. When asked the question, What changes would have to be made in order for teachers to use more technology?, I received many great answers. This is a list of their recommendations:

1) More training and workshops that are given during professional days.
2) Schools need to follow up on workshops and training sessions throughout the semester.
3) Computers need to be available for every student and teacher.
4) Each school needs a math computer lab.
5) The schools need updated computers and computer software.
6) Time allotments for teachers to become familiar and comfortable with the new technology.
7) A computer expert is needed to be assigned to each school to deal with computer malfunctions and any related problems.

My research results lead me to believe that Forsyth County high schools have made an attempt to comply with the recommendations suggested by the *Standards* document. Computers and calculators are being implemented into the math classroom. Calculators are being used more often than computers. I am encouraged that over time computers may be more widely used than now, because the math chairs feel computers are important in mathematics. They are all advocates of increasing technology use in the classroom and they have given their suggestions on how to make this possible.

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Literature: Teacher's Purpose of Instruction

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Introduction

Literature instruction is a topic of heated debate with individuals expressing concerns about what observers refer to as an increase of alliterates within a society based on literacy achievement. The problems posed by an alliterate individual interferes with the growth of this achieving and ever progressing society as well as curtail the opportunities available to the individual. Instructional methods implemented within the secondary English classroom concerning literacy development are often held accountable for this trend; thus the instructional methods of the English practitioner in reference to literature instruction are examined in this research. Methods of study used in this research include observation of instruction within the classroom and interviews of the classroom teachers observed. The analysis of the data is used to create suggestions and draw conclusions about the practices being implemented within today's secondary classroom and to provide a reasoning why teachers feel these methods facilitate the growth of literacy amongst their students in accordance with and in opposition to the theories which are proposed concerning their profession.

With an understanding of the content, or literature, and an acknowledgment of the context, the students, teachers of literature are searching for an answer to the increasing concern over the growing number of non-readers in our literacy based society. It is my contention that educators are attempting to find a balance between the two tenants of thought and to create a literate society within their classrooms. It is this balance of instruction which I intend to examine so that I may understand how teachers achieve this compromise.

Review of Literature

When students enter the secondary level of education, theorists of reading instruction, such as Chall (1983), believe readers develop a comfort level with reading and have progressed to a point where they are ready to begin reading in order to learn information which is new and informative. Readers at the adolescent age in their development are prepared to handle multiple viewpoints which present new information and allow for new experiences in learning for the students.

Wilson (1995) asserts that since the material which is being presented for reading coverage is more challenging and diverse, students are less likely to read independently. He concluded it is the teacher's responsibility to present the material in a manner which will motivate the students to read the material, creating an enthusiasm which allows the student to attempt to read the more difficult texts. With students developing through the stages of reading skills, it is important for students not to become stagnant or it will become more difficult for the skills to be acquired.

There are concerns that teachers, in an effort to motivate students to read, have abandoned the anthologies of the literature classroom in favor of easier texts which fail to challenge the students. Even with this concern, textbooks continue to play a prevalent role in providing information to students and teachers continue to believe it is a valuable resource in the classroom. Davey and Menke (1994) conclude that textbooks are designed to present the cultural knowledge and to prepare students to enter that particular culture. Corroborating this conclusion, Stern (1995) emphasizes the purpose of American schools is to teach the information that every American should know for successful participation in society. Teachers focus on the content of their presentation and emphasize this content to ensure complete comprehension is achieved by the students.

With practice strongly emphasizing the textual aspect of literature instruction, current instructional theory emphasizes the contextual aspects of teaching. There is sentiment in the reading theory community that there has been a long neglect of the individual in the literature instruction process and in order to motivate student reading, their interests and experiences must be accounted for in the presentation of material . Baldwin (1985) continues to state it is not necessarily previous content which influences the success of student learning but the interest level at which they approach the topic. Knowledge of the topic does not improve the performance of the students, but interest in the topic has a positive effect on their overall performance. With the interest level of the students important in reference to overall performance, theorists have felt a need for more student centered instruction within the secondary schools.

With a move towards student interest in instruction, there is concern that the text will be devalued and students will not achieve the level of education which has been given to previous students. Carbo (1987) believes that capitalizing on student interests will only be successful if students are presented with well written materials. Marino and Moylan (1994) found that readers are more concerned about having something good to read after they finish a good book. Students want to be challenged by the material they read and they feel rewarded in completing a difficult text. Only by challenging students with texts of literary merit will the efforts to motivate students be fully realized. Teachers must continue to provide challenging texts but present them in a manner which proves exciting to the students.

Effective literature instruction is based on four assumptions according to Applebee's 1991 article. The literature course should include literature of quality and interest in the classroom, anthologies should address the diverse cultures of America, there should be an emphasis on disciplined thinking in relation to the ideas revealed in the text, and the independent selections must work together in a manner which make sense to the students. In following these four assumptions teachers remove some of the reservations they hold in relation to contextual instruction because it is not a call for an abandonment of the text, but it is an approach which considers the students when implementing instruction.

With the research of individuals such as Applebee pointing towards a melding of the textual and contextual ideals, do teachers prescribe to one of these ideologies when planning and implementing instruction or do they think they try to achieve a melding of the two ideals? This possibility poses an interesting consideration when discussing literature instruction and the ability of teachers to create motivated readers.

Methodology

In order to examine the reasoning teachers have for their literature instruction in their classrooms and the emphasis they place in their instruction, whether it textual, contextual, or a balance between the two, I observed and interviewed three teachers employed at a large high school in a mid-sized city. The high school is situated in a middle to upper class neighborhood, drawing students of a mixed racial background which is influenced by the presence of a prominent business community and several universities.

The instructors involved taught tenth, eleventh, and twelfth grades, both honors and standard tracked, and were observed for a total of five class periods. My field notes consisted of the time the teachers spent covering the textual information versus the allowance of student contextual consideration, the availability of student responses to questions presented by the teacher, the design of instructional activities and how those activities influenced the focus of instruction, and the differences of instruction based on the tracking classification of the classes. Interviews were conducted to allow the teachers the opportunity to explain their thought process in relation to their tendencies of instruction.

After the field notes were gathered and the interviews were conducted, the information was analyzed to develop the teacher's objectives concerning literature instruction and their perceptions concerning their teaching. Decisions were made about the teacher's focus and the amount of emphasis they place on the text and to what extent they consider the student's interests.

Results and Conclusions

Based upon the field notes and the interview sessions there are some definite differences between the three participants and their purposes of instruction. Participant A is attempting to educate their students about the culture and history of the literature they are studying while Participant B feels that getting the students to love the literature and to enjoy their experience with the literature is the most important aspect of their instruction. Participant C is concerned with the expectations of their students in reference to the end of course test, thus they place a heavy emphasis on preparing their students to perform well on these tests. In understanding their purpose of instruction, one can conclude that Participants A and B provide their students more of an opportunity for contextual experiences than does Participant C. While this may be true, all three teachers feel they are following Applebee's four assumptions of a good literature program and are doing a satisfactory job in meeting their objectives in reference to instruction.

Consistently all three instructors attempted to frame their lessons with a contextual activity, exercising the use of open ended questioning was the most popular means, while presenting textual information. This trend was slanted heavily towards honors kids in reference to the contextual, but all three participants expressed a concern over whether standard students understood the text well enough to extend the discussion beyond the text. This is the only discrepancy which I feel varies from their belief that they are attempting to find a middle ground between the textual and the contextual. In supplying only the honors kids with the opportunity to extend instruction beyond the classroom the teachers are in reality confining the standard kids to textual instruction, thus limiting the possibility of stimulating the students ability to make a personal identification with the text.

Because of the availability of only five observations, a decision about whether the students were effectively motivated is not fully attainable. With the use of activities or questioning techniques which are designed to allow the students an opportunity to move beyond the text itself, the participants in this study feel they are meeting the needs of their students and are doing a good job of attempting to motivate their students.

Educators seem to be attempting to find a middle ground philosophically in an attempt curb the growing numbers of alliterate individuals, but as the research stated their instruction continues to be grounded in the textual. With teachers holding their beliefs that there are certain texts and literary conventions which they must teach, teachers must attempt to include contextual opportunities for their students within this belief system. Without an opportunity for students to personally identify with the text their lack of motivation will only continue to increase in relation to reading.

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What Do You Want To Be When You Grow Up?

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Introduction

Walk into any preschool, and typically you will find children playing "dress-up", and more likely than not you will find girls keeping house and boys pretending to be doctors or airplane pilots. Although we as a society do not acknowledge it, these children are displaying gender-stereotypical behaviors, behaviors that they will carry over into all aspects of their lives, including their career choice (Grossman & Grossman, 1994). As a rule males tend to aspire to occupations related to mathematics and science, such as engineering, whereas females desire those jobs in the arts and humanities, such as teaching (Oppler, 1993). With science and technology becoming more and more prevalent in our society, and the fact that women will make up a majority of the work force in the near future; women must break these gender stereotypes in order to compete in the job market they are certain to face.

Purpose

The purpose of this study is to determine the career aspirations of middle school students while also discovering if gender stereotypes still exist, and to ascertain if students have an adequate understanding of the mathematics required for the career to which they aspire. This study targets the middle school because at this level students are beginning to have attainable career goals and are being differentiated by ability to higher levels of mathematics, both of which will have a direct effect upon students' high school decisions.

Review of Literature

Current research on the employment of females, such as that by Chapman (1988), reveals that "young women's career aspirations and employment patterns are gradually converging with those of men" (p.46). However, women are not breaking into the traditionally male-dominated, and consequently higher paying jobs, in physical science, mathematics, and engineering. It is these areas in which there will be a great need for jobs in the future, in fact Rosser (1995) states that "attracting more men of color and women to the physical sciences, mathematics, and engineering would provide career access for these individuals while also filling the needs of our increasingly scientific and technical work force" (p.2).

Oppler (1993), in his study of middle school students' interests in careers of middle school, found that males tended to prefer careers that were in "mathematics and the sciences, technical vocations, athletics, and the military" as opposed to the females in the study who preferred the fields of "teaching, counseling, and social services" (p.7). These results indicate, according to Oppler (1993), a gender stereotyped pattern in career interests. Due to the fact that this study was conducted at the middle school level, it may be implied that a gender-based scheme of career interests is in place well before the high school level.

Another study of stereotypical thoughts in relation to occupations was done by Pettitt (1995). This study involving middle school students examined the career aspirations, as well as the students' perceptions of society's acceptance of certain career choices for men and women. Results of Pettitt's study (1995) revealed that the students felt that society accepted those individuals who entered into careers that were non-traditional. However, these same students had career aspirations for themselves that reflected gender stereotypes. This research further supports the fact that ideas concerning sex-roles and occupations are well in place at the middle school level, and thus it is this level that needs to be targeted more heavily so as to break these stereotypes.

With the small numbers of students, especially female students, entering into mathematics-related careers, more must be done to encourage and attract students into this type of occupation. One such method of intervention that has been used to attempt to attract more students into careers in mathematics has incorporated the PBS "FUTURES" series starring Jaime Escalante. This series was designed to introduce young people to a variety of occupations and have them see how mathematics is used in these occupations. Beckmann (1992) researched the effects of the FUTURES series on student attitude when it had been used in the classroom over a period of time as a part of the mathematics class. This research found that FUTURES did have a significant positive effect on the students' attitudes towards mathematics and science careers. This study shows that the use and introduction of role models and mathematics-related careers can be significantly effective in changing the attitudes of students.

A study concerning the usefulness of mathematics was done by Conwell and Prichard (1992). In this study the students revealed that although they thought mathematics was fun, they did not believe it would be important to their future work. Also of significance from this research is that fact that the students were not familiar with a large number of the careers represented. From this fact, it was suggested that educational systems need to do a better job introducing students to a wider variety of careers and occupations.

Methodology

The subjects of this study were one hundred and eighty-eight seventh grade students at a rural middle school in the piedmont region of North Carolina. All of the subjects responded to a survey with questions concerning their gender, career aspirations, and perceived usefulness of mathematics. From the questionnaires it could be concluded that, of the sample, ninety-one students were male and ninety-four students were female. Gender could not be determined from three of the surveys, therefore their responses were not included in the data analysis.

In addition to the questionnaires, fifteen students, seven male and eight female, were interviewed in an effort to get more in-depth responses. The interviews were done in small groups, consisted of seven questions, and lasted from eight to ten minutes.

Results and Conclusions

The responses to the surveys indicated that the career aspirations of the middle school student are quite varied. The one hundred eighty-five students aspired to a total of forty-seven different careers. There were eight students who indicated no career preference at this time. The most popular career choice overall, as well as for male students, was professional athlete. The second most popular occupation overall, and most preferred for females, was that of teacher. The list is broken down by gender and reflects what percentage of students (either male or female) preferred that career.

Research has shown that there is a need for mathematics and science related careers. In this research, it was found that only 12% of the total students aspired to such a career. This was 17.6% of the male students and merely 7.4% of the female students. Due to these relatively low percentages, it may be implied that students need to be made aware of the demand our society has for mathematics and science related careers.

The data concerning mathematics and science related careers also provides evidence of the existence of gender stereotypes in careers. Oppler (1993), in his previously discussed research, designated careers in mathematics and science, technical vocations, athletics, and the military as being stereotypically male. When the data from the questionnaires was compiled according to these categories, it was found that overall, 62.7% of the male students and only 10.7% of the female students aspired to these stereotypical male careers. These results might imply that women are not breaking the gender barrier at a significant rate if these female students, who are members of the class of 2002, aspire to the careers indicated in this survey. Thus, there is a need for the implementation of intervention programs designed to steer females into mathematics and science occupations at the middle school level.

Research also revealed that females tend to prefer careers in the arts and humanities, teaching, counseling, and social services. Results of the survey responses disclosed that 73.6% of the females and 17.6% of the males preferred occupations that were stereotypically female. These results indicate that males seem to filtering into the stereotypical female career domain at a greater rate than their female counterparts.

These results combined with direct quotations from individual students conflict the conclusions based on student response to the survey question, "If you were the opposite sex, would you still want to have the same job? Why or why not?" Based on the research sample, 62% of the total students, 57% of male students and 68% of female students, indicated that gender does not matter where careers are concerned. However, some of the students' statements were very stereotypical, such as, "Boys don't like ballet.", "Boys are not thought of as nurses.", and "Men are not interested in colors or decorating." The male students had similar stereotypical and somewhat chauvinistic responses, such as "Women should do stuff at home.", "Girls don't like getting dirty.", "Girls don't like grease.", and "A woman would want an office job." These responses indicate that although much progress has been made concerning stereotypical beliefs, stereotypes about careers still exist. Therefore, it would be beneficial for students to see individuals working in nontraditional career fields.

From the students' survey responses, it could also be determined that only 11.4% of the total students felt that their preferred career would require higher-level mathematics (beyond algebra). It should be mentioned that one interviewed student, a female aspiring to be a veterinarian, indicated that she would have to know "Calculus. One, two, and three." Because "that's what our teacher said." Teachers do have a powerful effect on students and thus more teachers need to discuss higher level mathematics courses with their students just as this teacher did. Quite surprisingly, the responses of 83.8% of the students disclosed that they were unsure of the mathematics their favored career would require. Consequently, it appears that more programs, such as the FUTURES series, are needed to educate students about the mathematics used in careers.

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Women and Girls in the Single-Sex Social Studies Classroom

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Introduction

Beginning in the 1960's and 70's, educators were called upon to offer a more gender-equal curriculum. With the explosion of "women's history" came the debate over girls' schooling. Now that women were claiming their place in history, how would this history be taught, particularly to young girls? In fact, the debate over curriculum content and classroom environment continues to be a central theme in the multicultural concerns dominating educational theory today. As Peggy Orenstein (1994) asks, "is it enough to simply call on girls more often or to introduce cooperative learning without changing the substance of the curriculum? Is it enough to change the substance of the curriculum but retain traditional classroom structures?"(246).

While there is been conclusive evidence that links single-sex environments to improved academic performance and self-esteem among girls, there has been little investigation into the curriculum of these classes. This research, therefore, is intended to examine how the curriculum of a single-sex classroom (within a single-sex school) treats women and women's issues, and to assess how such treatment affects the attitudes of the girls in those classes.

Review of Related Literature

Researchers agreee that single-sex schools and classrooms for girls are extremely beneficial. Morgan (1996) states that the "myth of coeducation. . . . pretends that since boys and girls. . . have equal access to all the educational facilities in public education, genuine coeducation is taking place"(116). In reality, she explains, coeducational public schools allow only White boys to "claim the study of white history as their own subject. . . .they can feel comfortable being educated into that tradition and can meaningfully aspire to take their place in it"(116-117). Perhaps more importantly, Byrke and Lee (1986) found that girls in single-sex schools had a more positive attitude toward academics and a higher self-image.

Higher education in particular has made progress in including women in the curriculum. Gruberg (1994) states that he and his colleagues work to include women in each of his courses. For example, he discusses women's rights in his course on civil liberties, and in his Introduction to Law course he discusses crimes against women, and how the criminal justice system handles those crimes. While the danger of using women solely as examples of victimization is cause for concern, the effort to be more gender inclusive is nonetheless evident.

Turning to social studies, DePauw (1994) recently studied the content of military history in secondary school resource materials, and found a series of "acceptable" roles for women. These histories portrayed women as victims, cheerleaders, nurses, covert operators, and occasionally "battlefield anomalies"(76). DePauw asserts that it is important to understand the origins of these roles, and to confront the implicit stereotypes, in order to recognize their significance.

Chapman (1978) offers a crucial examination of four ways women can be treated in a social studies curriculum, listing the benefits and negative aspects of each. Most significant is her conception of "contributory history," which focuses on what women were doing in traditional time periods--how they "contributed" to events--and frequently portrays women as solely caregivers or spectators.

A more radical approach is proposed by Tetreault (1987). She asserts that social studies courses should eventually embrace the "history of gender," rather than "women's history" as such. Attention would be focused on how gender affected economic systems, family organization and political systems over the course of history.

Methodology

Eight weeks were spent observing history classes at a private girls' school in North Carolina. Data was gathered concerning teaching style, the extent to which women were included in class discussion, and girls' reactions to class material and classroom environment. Ten girls were then randomly chosen to participate in interview sessions. Interview questions were as follows;

1. What does your teacher do to include women in your study of history?
2. How would you describe the balance between time spent on issues concerning men and time spent on issues concerning women in history? How do you feel about that balance?
3. Can you tell me about some of the women you have studied in your history class?
4. Have you been intrigued by any particular women you've studied? Is there any one women you especially admire? Why?
5. Do you enjoy learning about women's roles and issues in history? Why or why not?

Finally, data from both class observation and interviews was compiled and analyzed.

Results and Discussion

Classroom atmosphere

Girls remained on task throughout every observed class. They often talked amongst themselves about the issues, raised hands to participate, and eagerly answered teacher-posed questions. All students took notes vigorously throughout discussion, and quickly turned to their text--which they kept on their laps--for quick reference should any point of contention arise. Each teacher observed used a relaxed question and answer lecture format that allowed girls to participate freely.

Curriculum Content

Students in U.S. history classes were gifted ones, and used a standard college-level history text. This text included several highlighted sections devoted to women. In this sense, the text embodied Chapman's theory of "contributory history" introduced in the related literature review. That is, women are interspersed at certain points in the information, without becoming an integral part of the history as a whole.

The teacher's approach reflected this method consistently. When discussing the Civil War, for example, the teacher spent approximately five minutes noting the contributions of women nurses--focusing on Dorothea Dix and Clara Barton. Another reference to women during the Civil War era was a quick comment on how women, hearing of the imminent Battle at Bull Run, packed picnic baskets and went out to watch their husbands fight. As suggested by related literature, such information--especially when it is the only material discussed concerning women--is trivial, and therefore potentially demeaning.

Teachers also ignored prime opportunities to discuss women's roles. For example, in one European history class the topic of discussion was feudalism--specifically, everyday life in feudal Europe. The teacher highlighted the lifestyle of the warrior, of lords and vassals--even discussed what was expected of children on a daily basis--yet never mentioned what peasant women were doing at this time. The teacher could have stressed the various household duties of women, or could have emphasized that in this era women typically did as much farm work as men--a fact that would seemingly be of interest to girls today. Instead, no mention of women in this period was made whatsoever.

In eight weeks of consistent observation, there was one case in which it could be argued that women were treated in a manner other than that of "contributory history." During a discussion of the "Lowell System" of factory operation, the teacher explained to students that "young girls. . . were treated well, lived in boarding houses. . . and had lives not completely unlike yours." In this case, the teacher not only focused on the lifestyle of women, but also made an attempt to connect the experience of girls in history to what girls today experience.

Student Reaction and Perceptions

Student reaction to how women were presented in their history class was surprisingly consistent. For example, at the beginning of each interview, virtually every girl stated that their teacher was very much a feminist. Students expressed the opinion that the teacher "adds as much as she can" about women to the curriculum, and seemed sympathized with her efforts.

All ten students were also quick to point out that their teacher had no intention of including woman in the discussion "simply because they're women." One student stated that there "should be more on women in class, but stuff that's important--not just because of their gender." "For example," this same girl continued, "women who wrote books or were leaders, or who did something for society should be included--not like that Molly Pitcher we all hear about, who just carried water to soldiers. Who really cares about that? That's not really important--they just said that because she's a woman." The students in general seemed to recognize, therefore, the danger of demeaning women with contributory history, although they did not express it in such words. "Our teacher doesn't teach 'blurb' history," one girl explained, "that would just trivialize what women did. If it's important, she mentions it." Ironically, observation data suggests that the teacher did just that.

The extent to which women should be included, then, understandably raised some intriguing issues. One girl suggested that the reason for including women in the history books should be the same reason for including men. "It would be whinny to try to make an even fifty-fifty split between men and women," she explained. Another girl agreed and added, "besides, it would be too obvious if we just stuck in paragraphs or extra pages to deal with people's angry emotions." Such statements question the validity of including women's voices, and suggest that asking for equity means inciting "angry," "whinny" emotions. Yet in class, as suggested by observation data, girls rarely suppressed their emotions or thoughts. From where does this contradiction emerge?

Because their history class does little to validate the female experience, the conflict between how students behave and how they assess women in history should not be surprising. This notion of detachment was expressed in various ways during interview sessions. One student, for example, was adamant in making a particularly interesting distinction between what she and her peers learn and what they experience. "The truth is," she explained, "men *have* dominated--it should be changed, but we must teach *history*. Here [at the single-sex private school] we can face these facts, because *women* dominate here."

Implications

It would seem, then, that while girls may not feel a connection with the women who came before them, they certainly sense the issues of dominance and subordination associated with gender as it is presented in their history class. The desire to study women of importance, and a lack of concern for or knowledge of women's experience throughout history is evident in these girls' voices. A crucial question is then raised as to how girls see themselves in society. If they feel detached from the experience of women in the past, or feel that women who have succeeded in typically male-defined patterns of leadership and conquest are the only women worth studying, will these girls feel they are a part of the process of history?

The answers to such questions are debatable, but the detachment the students feel from history is less so. Certainly, the atmosphere of the single-sex classroom is a beneficial one for girls, as evidenced by the eager participation witnessed during observation. Yet this active involvement is certainly not being reflected in material the girls are receiving--according to their text and the information provided by their teacher, women have not been particularly active or involved. Perhaps, then, until the history curriculum is modified to include women's voices, it is best the girls remain detached--at least then girls may continue to thrive in an environment that allows them to participate, that validates their abilitiy and their worth.

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Teachers' Expectations:
Implicit and Explicit Communication in the Classroom

by

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Introduction

Hanging on the walls in each classroom of the high school where I observed English teachers this fall was a cream-colored poster with gold Old English type on it. Across the top of the poster was written "Commitment to Discipline and Learning." Studies have shown that high expectations, such as the ones suggested in the title of this poster, can influence student performance and achievement in a positive way.

While formalized school-wide expectations like the "Commitment to Discipline and Learning" sound good, "those things work only when they are adapted by people who understand how to take that kind of thing and lose the system rhetoric and put those things into action," said one teacher from the high school where I observed. Teachers enact expectations in the classroom daily, and while the effect of their expectations on student achievement has been studied in some depth, what expectations are actually communicated and the ways in which teachers enact them is understood in less detail.

In this paper, I examine three teachers' expectations and the ways in which they carry them out at a suburban high school in Winston-Salem. The fieldnote excerpts and transcriptions of classes describe the processes by which teachers "put [their expectations] into action" in their everyday interactions with students in their classrooms. I argue that a variety of expectations are continually being defined and negotiated implicitly as well as explicitly in classrooms. Expectations are communicated to students collectively and individually through a teacher's language and through the teacher's arrangement of task structures.

Literature Review

Early studies of expectations in the classroom have proven that there is a strong relationship between teachers' expectations of students and students' performance or achievement. The seminal study that set up the expectancies/performance model is Rosenthal and Jacobson's *Pygmalion in the Classroom: Teacher Expectation and Pupil's Intellectual Development* (1968). Since that study, the self-fulfilling prophecy associated with expectations and student achievement has often been referred to as "the Pygmalion effect." Other studies have followed in the footsteps of Rosenthal and Jacobsen's, researching variations of the theme they began (Brophy & Good, 1970; Jose & Cody, 1971).

More recent studies have approached the issue of teachers' expectations from a sociolinguistic perspective. In "A Sociolinguistic Approach to the Study of Teacher's Expectations," Cherry (1978) detailed a new approach to investigating expectations in the classroom. She argues that if expectations exert such a powerful influence over students' behavior and academic performance, then how teachers' expectations are communicated must be understood in more detail. Sociolinguistic approaches provide a way to examine student/teacher interactions in the classroom. Examining conversational structures is one aspect of sociolinguistic studies, and Wilkinson has used this approach in her examination of teachers' expectations (1981). Other aspects of sociolinguistic analysis involve examining the contexts in which students and teachers interact (Erickson & Shultz, 1981). Lessons are one type of classroom context that has been examined closely (Green, Weade, & Graham, 1988). These types of studies have been the ones that have informed my ethnographic study of teachers' expectations.

Methodology

My field work was carried out in the classrooms of three English teachers in a high school located in a suburban area of Winston-Salem. I observed ten hours of classes taught by each of these three experienced teachers. During the first half of the semester, I collected fieldnotes and informally discussed classes I observed with the three teachers. To the limited degree that fieldnotes can be validated, these conversations often helped serve that purpose by clarifying events or providing the teachers' initial analyses or reflections about classroom occurrences.

During the second half of the semester, I began discussing with the teachers my ethnographic study of expectations. I tape-recorded and transcribed parts of five classes taught by each teacher. The final stage of my research involved pre-arranged forty-minute interviews with each teacher. The interviews were informal and included open-ended questions.

While my fieldnotes and recordings of the classes involved students' comments and responses, the focus of my data gathering was on teachers' comments and actions. Further study on expectations in the classroom needs to pay more attention to describing and discovering students' implicit and explicit expectations and the specific ways in which these complement and conflict with teachers' expectations.

Discussion

The general theme of teacher's expectations can be broken down into four specific themes: communicating expectations through language, communicating expectations through task structures, negotiating group and individual expectations, building on teacher/student relationships. The following discussion provides a summary of the first two themes, since these thematic narratives comprise the bulk of my findings and analyses.

The most obvious way that expectations are communicated in the classroom is through language. Teachers express expectations both explicitly and implicit through the things they say to their students. Explicit communication of expectations can be broken down into three categories: short imperatives (ex. "speak up"), detailed imperatives (ex. "raise your hand and articulate your ideas instead of just mumbling your answers all at the same time"), and declaratives (ex. "I don't want to know what it is like. I want to know what it is," "You are scholars").

The frequency of explicit communication of expectations seems fairly limited in the classrooms I observed when compared to the numerous ways in which expectations are communicated implicitly through teachers' talk with students. For example, Teacher A's expectation for her students to cooperate and be good "citizens," an expectation she states explicitly in my interview with her, is revealed through the following language: "Help me answer this question," "We'll help you answer that question," and "We're family in here." Her frequent use of the first person plural pronoun and the word "family" implies that she believes that the class is, or expects the class to be, a close-knit community. This noun and pronoun combined with Teacher A's repeated use of the verb "help" suggests that she expects participation in this classroom to be based on a spirit of cooperation.

Teacher B creates a different kind of expectation for how the class is going to function in his talk with his students. He frequently reminds his students that they are in the tenth grade now and need to study some on their own. He says things like, "If you do poorly, you know why" and "Blame it on yourself for not trying" and "You've got to talk or you're going to fail." The language in this classroom is dominated by the second person pronoun "you," a reflection of the teacher's expectation that the students themselves need to take responsibility for their own learning. In an interview with Teacher B, he said that he "at least expects for them to try" and that "it is my feeling that at this point they need to take responsibility for their actions." These expectations are communicated indirectly through comments like the ones quoted above.

Teacher C uses language to express his expectations indirectly in quite a different way from the other two teachers. At the beginning of class one morning as Teacher C was taking attendance, a student made a smart-mouthed remark about some aspect of the class. The teacher responded to the student's remark by comparing the student's comment to one that an eighteenth-century "wit-wood" might make. This character from Restoration literature tried to be witty, but never succeeded. The teacher concluded this incident by saying to the student, "you can be a true wit if you would just act like one." This fieldnote description illustrates how Teacher C uses sarcasm as a vehicle for expressing his expectations in an oblique way. Although the teacher uses this remark to cut the student's remark down, he also suggests that he believes the student is capable of engaging in more sophisticated humor. In an interview with this teacher, we discussed this incident. Teacher C said that he tries to "[make] fun of the stupid thing, not the kid. . . . I can use my sarcasm to hug the kids and I think I can use it to cut them in half. But when I cut them in half, I'm always willing to come back and get them." Sarcasm for Teacher C is a form of action, a way of, as he so aptly described it in my interview with him, "adapting" an expectation like the one listed on the poster in every classroom-- "commitment to discipline and learning," "[losing] the system rhetoric and [putting] those things into action."

Expectations are also communicated implicitly through the participation and academic task structures in the classroom. A comparison of how vocabulary lessons are structured in each of the three teachers' classes helps to clarify the ways in which the teachers' expectations differ. Teacher A asks her students to work in pairs to figure out the meanings of words from contextual clues. At one point during this lesson she says to her students, ""I don't hear y'all picking each other's brains." The teacher's comment combined with the structure of this task suggests that the teacher expects her students to act as detectives, investigating knowledge that is laid in front of them. Teacher C asks students to come up with a sentence out loud for the vocabulary words he gives them. If the students do not provide enough context so that the meaning of the word is clear, then the teacher asks them to make another sentence or to expand their first one. This task structure reveals the teacher's expectation of students' roles as that of a builder or creator. In stark contrast to these two lessons is a lesson that occurred in one of Teacher B's classes. During this lesson the teacher gave the students a word and then proceeded to give them a definition of the word and examples of what it means. The students participated by asking the teacher to repeat the definitions or his examples. The structure of this lesson reveals an expectation of students' roles as that of a passive receptacle of knowledge that is given to them by their teacher.

Conclusion

Research that locates expectations in teachers' interactions with students is more helpful to new teachers than research that locates teachers' expectations in student achievement scores. Being aware of the powerful ways in which expectations can be communicated implicitly and explicitly through language and task structures in the classroom is crucial to any teacher, especially to the ones who struggle to influence those students who have low or no expectations of themselves when they enter the classroom.

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Student Participation in the science classroom:
A gender issue

by

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Introduction

Research has shown that male students participate in sciences classes more than female students (Banks, 1988; Belenky, Clinchy, Goldberger, & Tarule, 1986). Also, research indicates that the gender of the teacher has an effect on class participation (Constantinople, Cornelius, & Gray, 1988).

The purpose of this study was to determine teacher-student interaction by observing participation behavior of students in the science classroom. More specifically, gender differences in participation were recorded. The gender of the teacher was taken into account while studying the participation rates of the students. Do students participate more in female-led classrooms? Do male students participate more than their female counterparts. This study will attempt to answer these questions. It will also try to give teachers advice on how to increase student participation.

Review of Literature

In high schools, studies were conducted to identify the quality and quantity of science classroom interactions in relationship to gender. The results suggest that female students have fewer interactions with science teachers and thus receive less attention. Males, on the other hand, received more teacher interaction including more questions. It is likely that this results from male students exhibiting more disruptive behavior than female students (Morse & Handley, 1985). Teachers asked male students more high-level questions than female students (Barba & Cardinale, 1991; Tobin & Gallagher, 1987).

Past studies indicate that male students participate in science classes more than their female counterparts (Banks, 1988; Belenky, Clinchy, Goldberger, & Tarule, 1986; Constantinople, Cornelius, & Gray, 1988). Of particular interest, Constantinople et al. (1988) found that an increase of participation in classroom discussions resulted from having a female instructor. However, Fassinger (1995) found that the gender of the instructor had no significant impact on class participation. Helping to resolve this discrepancy is very important and one major reason for conducting this study. Do students participate more in a female-instructed classroom? Or, does faculty gender have no real effect? In general, do male students participate in discussions more than females? Also, do teachers influence participation by asking more questions to male students than to female students? To answer these questions I will observe male and female teachers and their classroom participation rates.

Methods

Teachers from three high schools in the Winston-Salem/Forsyth County school system were selected for the current study. The population of interest included science teachers and their students. Six science teachers participated in this study over a span of five weeks. The observations intended to show the teacher/student interactions in the classroom. There were four observation periods per teacher (one observation period equaled a regular class period). A participation observation sheet was used to collect the data. A checklist of the following items comprised the participation observation sheet: 1) question to student (from teacher), 2) question to teacher (from student), 3) off-task response or shout out by the student, 4) question to the entire class (from teacher), 5) response to student (from teacher), 6) response/statement to teacher (from student), and 7) teacher/student discourse (one minute or longer conversation). Each time one of these items occurred, a tally was placed next to the appropriate category on the observation sheet. The gender of the student was also noted in each case. Of the six science teachers, three were female and three were male. The gender of the teacher was also noted on the observation sheet. Each of the teachers was given a letter as a pseudonym (example, teacher A).

Analysis includes a compilation of data from each of the teachers (four sets of data per teacher) and also, a collective compilation of data according to the gender of the teacher (12 sets of data per male and female teachers). It is an attempt to determine the teacher/student interaction patterns and to find the participation rates of the students in the classroom. The data will show if male students participate more in science classes than do female students, as seen in previous research. Also, the research will show if male or female-led classrooms contribute to a greater student participation rate. The data will also indicate the number of questions asked to male and female students by each teacher. This will indicate if male students are asked more questions than females.

Results

An analysis of the data indicates that female students participate more in science classes than do their male counterparts. A compilation of the data shows that in all six of the teachers' classrooms, female students participate more than the males, regardless of the female student population. Also, the data indicates that female teachers ask female students more questions and male teachers ask male students more questions.

Female vs. Male Participation Rates

Student participation (for male students) was determined by the following equation:

$$\frac{\text{\# of questions or statements by male students}}{\text{all of the questions or statements}}$$

This equation was used instead of simply counting up the number of male questions or responses, due to the differences in numbers of male and female students in the classroom (see figure 2 for a simple breakdown of the percentage of only male students in the classes and their participation percentages). In the classrooms of teachers A, B, D, E, there were more female students than male students. Also, note that in all cases female students had a higher participation percentage than the male students (except for teacher F's classroom, which had an equal female/male participation percentage). This is significant because even in classrooms with more male students than females, the females participated at an equal or higher rate than the males. The female participation percentage for teacher A was 70%. For teacher B, female participation was 65%. In teacher C's class, the female percentage was 56%. Teacher D's female participation percentage was 71%. Teacher E's percentage was 64%. Lastly, teacher F's female participation percentage was 50%.

The breakdown of teachers A-F and their genders is as follows:

teacher A - female
teacher B - female
teacher C - male
teacher D - male
teacher E - female
teacher F - male

When looking at the genders of the teachers, female participation in female-led classrooms was an average of 66%. For male-led classrooms, the average for female participation was 59%. For male participation in female-led classrooms, the average was 34%. Male participation in male-led classrooms averaged 41%. The data used for determining student participation by gender consisted of adding up all of the tallies for each teacher from these categories: 2) question to teacher, 6) response/statement to teacher, and 7) teacher/student discourse. Then, this number of tallies (of males, for example) was divided by the total number of all questions or statements by both male and female students.

Questions Asked to Students

The breakdown by gender of the total number of students in classes is given in respect to female and male teachers. Also, the number of questions asked to male and female students by female and male teachers is given. This data (more simply shown in table 3) shows that female teachers asked more questions (24) to female students than to male students (17). Male teachers asked more questions to male students (45) than to female students (35). The category of data used for this section is 1) question to student (by teacher). All of the tallies for this section were added up. The total number of questions asked by each teacher was then divided into a male or female teacher group. The three female teacher totals were added together to get the final number of questions asked to male and female students. The same was done for the male teachers' information.

Conclusions

The results of this study do not resemble the typical results found in previous research. In this study, female student participation rates are higher than (or equal to in one case) the male student participation rates. This does not follow the trend that is found in the literature review. Other studies have found that male students out-participate their female counterparts in nearly every situation (Banks, 1988; Belenky, Clinchy, Goldberger, & Tarule, 1986; Constantinople, Cornelius, & Gray, 1988). The findings from my study show that regardless of the number of female students in a class, the female student participates equally to or more than the male students. This fact does not indicate that there is an intimidation factor or lower self-esteem in female students (as is seen in the literature review). The females in the classes that were observed in this study seemed confident and sure of themselves. This does not correlate with a previous study that linked low female class participation to a fear of appearing unintelligent to peers and a fear of showing ignorance (Banks, 1988).

The total number of female students in all of the observed classes equaled 266. The male student total was 225. This result might be a signal to future teachers and researchers that more female students are enrolling in science classes now more than ever. The new surge in enrollment might lead to greater female participation rates. Females might feel more comfortable in a classroom where the majority of the students is female.

From the results of this study, it can be stated that female participation levels were slightly higher in female-instructed classrooms than in male-instructed classrooms. Male students participated slightly more in male-led classrooms than in female-led classrooms. This finding raises a question of the effects of faculty gender. In an earlier study by

Brooks (1982), it was determined that males have been found to participate more in female-taught classes. The new data from this study indicates that some students do participate more in female-led classes, but there is not a large significant difference in the data to conclude that most students participate more in female-led classes as the literature suggests.

Another finding from this study suggests that female teachers ask more questions to female students and that male teachers ask more questions to male students. This, too, does not coincide with previous studies (Barba & Cardinale, 1991; Tobin & Gallagher, 1987). Morse and Handley (1985) found that male students received more interaction including more questions. The results from my study show that only in male-led classrooms, do male students receive more questions. Although the difference in the number of questions asked to male and female students is not very large, this new data shows another trend of female students receiving more attention from the teacher than in the past.

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What kinds of questions do teachers ask in the classroom
and
how do students respond?

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Introduction

John Giles, a social studies teacher in the Winston-Salem/Forsyth County Schools, often opens his classes with a question: "How was Squanto an instrument of God?…Do yawl ever get bothered when you see bad grammer?" Questions were the centerpiece for learning. Yet, despite teachers like John Giles, there is a tremendous lack questions that generate active student participation and student construction of meaning in the classroom.A school teacher once said," I was locking students out of any genuine inquiry, for my questions indirectly sought confirmation for the 'correctness' of my own interpretations. I rewarded passivity by teaching that answers were ready-made and one-sided, requiring only an ear, good notation skills, and the ability to memorize" (Muldoon, 1990 p.34).Muldoon as does Giles, recognizes the vitality of questions in the process of learning. Therefore, I want to go into high school classrooms and find out if teachers do in fact ask questions that call for student reflection rather than student fact finding. Furthermore, I am interested in how students respond once the teacher asks them a reflective question.

Review of Literature

John Dewey was unequivocal about the importance of questions: "What's in a question, you ask? Everything. It is the way of evoking stimulating response of stultifying inquiry. It is, in essence, the very core of teaching (p.266). Dillon (1984) describes questioning by saying, "To know how to question is to know how to teach" (p.152). In his definitive picture of America's classrooms, Goodlad (1974) found that only 5.1 percent of all classroom time was spent in discussion" (p.47).

Stodolsky found that 75% of the task oriented activities were based upon the knowledge or comprehension level. Kerry (1984) found that in 1638 interactions between teacher and students, only 10% used questions to get students to think. Even when teachers asked questions about subject matter, Gall found that 60% of their questions required only factual recall. But Schaffer (1989) and Muldoon (1990) feel that teachers don't know how to facilitate more thought provoking discussions encourage both student response and teacher questions. Muldoon suggests that the teacher have the student clarify with a reference to the text or a clarification of the students thoughts. Patrick (1986)feels that, "In order to promote more reflective thinkers teachers must create an open, supportive, and structured classroom climate where opinions are heard and extended…everything goes expressed." In my study on questioning, I am not simply looking for fine questions but what types of questions evoke reflective student response.

Methodology

Subjects

The research is based on 36 hours of classroom observation in three North Carolina public high schools. Subjects were observed in four different classrooms, with four different teachers.

Instruments

Using an ethnographic approach, this study was designed to observe the interaction between students and teachers in the setting of the classroom. As a result, the only instruments I used were field notes and a field chart. My notebook was designed with two columns, one for questions asked and one column for student responses. My field chart was used to label teacher questions as *expansive*(Should we have a tougher crime system in the U.S.) or *reductive*(In what year did the U.S. gain its independence?) ; the chart also documented whether the student response was *mechanical*(one that required only retrieval of factual information, or a yes or no response) or *reflective* (one that evaluated, opinionated, or generated further questions).

Discussion

In my visits to three local high schools I found that 75.6 percent of the time teachers ask *reductive* questions such as, "Who lived on the Tiber river? Who conquered the Romans? Who fought in the War of 1812? In what year did the Boston Tea Party occur?" *Expansive* questions accounted for only 24.4 percent of the questions teachers asked in the classroom. Of all expansive questions asked, 50% were questions that asked students for their *opinions*. But not to my surprise, only 18.8 % of the expansive questions asked students to *evaluate* and draw conclusions from a body of knowledge. I also found that students *generated* questions in the classroom. In fact, 31.3 % of the *expansive* questions asked in my observations were asked by students.

But what was more fascinating was student response to expansive questions. *Opinion* based questions promoted little analysis or thinking and in fact were as equally ineffective in promoting student reflection as were *reductive* questions. Their answers were usually yes or no, or one word. Opinion based questions were often a quasi-attempt to open a discussion when in fact they simply delayed any attempt at critical thought or insightful commentary in the classroom. The research also points out that when questions were asked that demanded student interpretation and *evaluation*, (this was not common in the four classes I attended), students were receptive and responded with individual thoughtfulness. When students in one class were asked, " What do you think the meaning of Raskalnikov's dream was?," one student said, "Well, I think his intellectual side is speaking." The teacher then asked, "What part of Raskalnikov is speaking?," which another student responded, " I think the horse represents Russia, and he is trying to kill the horse and thus himself." Students were here creating meaning in their response to evaluative questions. Interestingly, student *generated* questions were almost always reductive in nature. In turn, this made their fellow students and teachers responses also based on fact. A student asked his teacher, "Could you go to jail for being an adulterer back when Andrew Jackson was president?" The teacher responded with a quick "Yes."

As I moved from observing teacher questions to understanding student responses, I realized that each was dependent on the other. But I also recognized that teachers were rigorous in their use of reductive questioning, seemingly using them to control the class rather than student generated learning. I saw this not only in teacher questions but in the quietness and inactivity of student responses. As a teacher it is therefore paramount that we not only scrutinize our questions but that we listen to our students responses. In the student response we find what kind of questioner we are and thus what kind of teacher we have become.

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Gender-Stereotypical Behaviors in High School Classrooms

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Introduction and Review of Literature

A growing concern is evolving around gender equity, particularly with the effects it may have on the development of girls. According to some researchers, gender discrimination is pervasive in most every aspect of girls' development. At home girls model their parents' behaviors, play with certain toys, and follow rules that are not typically the same as those of their male friends and siblings (Debold, Wilson, & Malave, 1993; Sadker & Sadker, 1994). In schools, "sitting in the same classroom, reading the same textbook, listening to the same teacher, boys and girls receive very different educations" (Sadker & Sadker, 1994, p. 1). Orenstein (1994) projects that girls are likely to enter adulthood "at a deficit: less able to fulfill their potential, less willing to take on challenges, [and] less willing to defy tradition in their career choices" (p. xxviii). A question studied persistently among researchers asks why these differences evolve as girls and boys get farther into their educations. Why are their experiences incongruent when they sit in the same classrooms?

The explanations for these differences vary among researchers. Orenstein (1994) sees the fundamental problem as girls' diminished self-esteem. She determines that we need to look at how girls define themselves. Looking at the problem from a similar standpoint, Brown and Gilligan (1992) found that the young girls expressed themselves in strong, clear voices. By the age of ten, however, the girls were beginning to substitute boldness with passivity. Adolescent girls' voices were almost flattened completely under the "good girl" image that they were trying to uphold. This aspect of girls' socialization contributes to the difference in girls' and boys' school experiences (Brown & Gilligan, 1992; Debold et al., 1993).

While Sadker and Sadker (1994) would agree that internal influences are a problem, they carry their reasoning further, even into the history of women's education. According to their research on women's education, schools have modeled themselves to comply with social stereotypes and beliefs throughout history. This brief summary outlines some of the explanations researchers have given in attempt to explain the difference in girls' and boys' educational experiences.

In the early 70s, stereotypes were found to be so pervasive that clinical psychologists deemed stereotypical characteristics as indicative of mentally healthy persons (Broverman, Broverman, Clarkson, Rosenkrantz, and Vogel, 1970). "Healthy" males were typically men who were aggressive, independent, dominating, active, and logical. Women who were dependent, passive, unagressive, cooperative, neat, and talkative were examples of "healthy' females. Relevant to this research is the matter of whether these stereotypes color the culture of the classroom. According to Chapman (1988), we hold "unexamined assumptions" about gender (p. 5), and these assumptions affect the school community. Chapman perceives gender-stereotypic behaviors as being learned in school. Schools and the classrooms within them need to be targeted for exploration about altering the patterns that contribute to these gender-stereotypical behaviors (Chapman, 1988). Within the classroom, we can look at class structures and activities, teacher-student interactions, and students' perceptions.

Class structures have been found to affect students' stereotypical behaviors (Campbell, 1995). Less structured classes are likely to encourage boys' dominance. Incorporating cooperative learning activities into the curriculum has been found to be advantageous for girls. Research has pointed out that although teachers often think of their classes as encouraging gender equity, chances are that girls are still being shortchanged (Sadker & Sadker, 1994). Research concerning teachers and their interactions with the students further explains the differing educations of girls and boys.

If it is true that students evaluate and modify their attitudes and behaviors to fit gender appropriate ones, we need to look at what influences they confront daily in their schools (Chapman, 1988). Girls are not challenged in the same ways the boys are in their classrooms; they attribute their successes to luck rather than intelligence or ability. As they continually attribute their successes to luck and situational circumstances, their chances at future success diminish. In contrast, boys attribute their accomplishments more readily to their effort and ability, increasing their chances of future success (Horgan, 1995; Orenstein, 1994; Sadker & Sadker, 1994).

In studies that have asked girls and boys to answer the question "If you woke up tomorrow and discovered you were a (boy) (girl), how would your life be different?" (Baumgartner, 1987; Orenstein, 1994; Sadker & Sadker, 1994). Nearly all of the comments made by boys were negative. Two comments that were common to these studies, "If I were a girl, I would want to be a boy," and "If I were a girl, I would kill myself," show just how horrible a sex change seems to the boys (Baumgartner, 1987, p. 7; Sadker & Sadker, 1994, pp. 83-84).

Girls said that they would get treated better. Being a boy was seen as highly advantageous. They felt that they would have more opportunities and the right to be active, loud, more outspoken and confident. These perceptions have been found to be a result of students' internal influences.

Campbell (1995) looks at these responses and determines that reforming the "girl problem" by making girls change is not the answer. The environment in which girls are learning needs to change. This research aims to understand these gender differences and determine if these behaviors are reflected in routine classroom behaviors.

Methodology

The subjects studied were high school students of various grade levels. Observations were taken in thirty mathematics classes. In most of the classes observed, the ratio of girls and boys was approximately the same. Students were observed during lessons, class discussions, and as they were participating in group activities. Also, student interviews were conducted with seven high school girls. All seven of the girls were in high level mathematics classes. The interviews were included in the research to determine whether or not female students recognize gender-stereotypical behaviors in their schools.

Results/Conclusions

The compiled data was analyzed by partitioning the observations and interview responses into groupings relevant to the topic of gender-stereotypical behaviors. One grouping of data to be analyzed dealt with the students' participation in class. This set of data was observed while the teacher was leading or guiding the class. When the teacher exhibited the most control, students were called on to answer questions. Girls were called on 30% of the time while boys were called on 70% of the time. These results are consistent with the literature. Studies found that girls were consistently called on less than boys during class (Orenstein, 1994; Sadker & Sadker, 1994). Student B said, "Guys are called on more in some of my classes. The teachers think [the guys] know how to do it better." Student C had a similar comment: "Guys answer questions all of the time. Girls are intimidated to answer because [guys] are quick to judge and make fun of you when you say something wrong."

When students were calling out answers freely without the teacher calling on them to answer, the girls called out 23% of the time while boys called out 77% of the time. Student E said, "Guys think they should control the class, so they try to stand out when they answer." Research also indicates that this is the norm. When teachers let the students have more control of the class interactions, boys are likely to take the lead (Chapman, 1988).

The discussions consisted of the teacher and the students working through problems together, exploring the steps as they went. They are separated form the "calling out" data because of the atmosphere involved. Discussions were slower paced than the less controlled environment that allowed the students to take the lead. Girls participated 90% of the time while boys participated 10% of the time. Student C commented that girls tend to be more reserved and quiet in class, so a class with a more relaxed atmosphere would make them more comfortable. Student A said, "Girls need extra help and explanations from teachers. Girls concentrate more than boys in class." This data, too, is consistent with the research. Girls have been found to benefit from cooperative activities and activities that are less rushed. They are then able to contribute and provide significant input during discussions (Koehler, 1990; Sadker & Sadker, 1994).

Lastly, students were observed during group work. When the groups were composed of at least 50% girls, they could be expected to be engaged in discussions where the students were teaching each other. They shared with and instructed each other. Comments like these were consistently found in these groups: "I did it this way...How did you do it? Explain your answer...Oh! I see...This is what you do...Wait! *How*?...Don't get upset, we'll all get this...But, I don't understand the rules of exponents. Tell me again...OH! OK!" The students in these groups worked well together, watching each other work problems, comparing answers, and showing each other how to make sense of the math involved.

The only weakness observed in these groups was that oftentimes the boy(s) did not participate. They worked independently without the support of the group discussions. Also, the groups that had more boys than girls did not communicate as much as the other groups. They tended to work independently and consult each other for help rarely.

After analyzing the data, the definitions of normal, healthy males and females given by clinical psychologists in the 1970s do not seem too strange. Girls in the classes observed were depicted as passive in class participation and cooperative in groups, benefiting from their communication with other students. Boys were aggressive in answering questions, dominating in some instances, and preferred to work independently. During observation, though, teachers were taking some measures contributing to gender equity. They used examples of girls as often as they did boys in their lectures. Also significant was that all of the girls interviewed made statements about their higher level classes being more equal, so some changes have obviously been made over the years.

Implications

When considering Koehler's (1990) summation of the reality that, "...schools do not function in a vacuum. They reflect the dominant cultural values and expectations of the society they serve" (p.166), educators can take a leading role in the reformation of the gender-stereotyping that is still invading school curriculum today.

Teachers can help their students by encouraging them into courses that have traditionally been viewed in biased ways. They can encourage them to pursuit nontraditional careers by presenting them with role models and examples of men and women who have defied socially scripted norms. Horgan (1995) encourages us to reverse the damage of stereotypes by teaching against them. She calls for intervention in the classroom. Girls as well as boys need to be encouraged to take risks, accept mistakes, and attribute their successes to their abilities in order to gain more positive self-images. "Girl friendly" classes have less competition and comparison among students, providing a more relaxed atmosphere for learning (AAUW,1992).

Changing the perceptions of males and females in our society is not the sole responsibility of teachers. However, if educators are willing to commit themselves to equal education for all of their students, damaging assumptions about girls and boys can be recognized and challenged in our classrooms.

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How Do Teachers Customize Their Motivational Strategies?

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Introduction:

Educational psychologists have well documented the correlation between student motivation and student achievement. Low motivation has been identified as a severe problem for many underachieving students. Teachers as well as parents, peers and society as a whole have the ability to influence a student's motivation to learn. Because teachers have this influence it is crucial that research be done to determine how they can most effectively use it. The current study endeavors to determine how teachers are customizing their motivational strategies to best use their influence.

Review of Literature:

There is an abundance of research linking high motivational levels with high achievement. Three areas of student motivation research which relate to how teachers customize their motivational techniques to cater to different types of students, are important to this study. The first is the theoretical framework of student motivation, the second concerns itself with specific strategies for enhancing student motivation and the final deals with the effects of such variable as gender, ethnicity and socioeconomic status on student motivation.

Ames' (1992) discussed the effects of different goal structures on student motivational patterns. She suggested that the development of mastery or performance goals is heavily influenced by the classroom learning environment. A classroom where success is defined as improvement encourages mastery goals, while a classroom where success is defined as high grades or high normative performance encourages performance goals. Another often relied upon theory is the *expectancy x value* theory developed by Feather (1982). According to this theory teachers must help students see the value of the subject matter as well as make sure that the task assigned can be completed successfully if students put forth a reasonable amount of effort.

The most comprehensive set of motivational strategies is found in Brophy's 1987 paper. The most impressive portion of this paper is it's list of strategies for motivating students to learn. Brophy (1987) has broken his list into five separate categories, essential preconditions, motivating by maintaining success expectations, motivating by supplying extrinsic incentives, motivating by capitalizing on students' intrinsic motivation, and stimulating student motivation to learn.

Many factors may be critical in developing an understanding how to most effectively motivate different students in the classroom. In the studies which follow, difference in achievement motivation are investigated across genders, ethnicities, and ability groupings. In his 1994 paper Hootstein attempted to identify the strategies middle school history teachers motivate their students. He also asked teachers to explain why particular strategies are motivating and what factors make it hard to motivate students. Perhaps more useful than the particular strategies are the reasons teachers believe they are effective. The reasons include satisfying students' need for affiliation, autonomy, physical activity.

Atwater, Wiggins and Gardner (1995) compared urban students with high and low attitudes towards science. Another interesting correlation is that African-American females tend to have mastery goals, while Caucasian females tend to have performance goals. They also found a significant difference between the motivation of African-American males and females. African-American males had a significantly higher level of motivation.

Cannon and Simpson (1985) look at the effects of ability grouping on motivation. What they find is that ability grouping and gender both influence motivation. They found significant correlation between ability grouping and motivation.

It appears from most of the papers written concerning the effects of socioeconomic status, gender, ability grouping and ethnicity on achievement motivation that gender is the only variable that consistently results in significant different levels of achievement motivation.

The review presented here supports the importance of student motivation to academic success. As an important factor influencing academic achievement, a full understanding of how teachers attempt to maximize student motivational levels through customization is important.

An effective motivator will utilize out-of-school factors to customize techniques to increase the motivational levels of a particular group of students. In this report, the methods teachers use to motivate different types of students will be investigated to determine the extent to which theses techniques are customized.

Methodology:

The objective of this research is to determine how science teachers customize their motivational techniques depending on the type of students they are working with. Ten high school science teachers working in the Forsyth County School System were chosen to participate in the study.

Each teacher participated in an open ended one-on-one interview administered by the researcher. The final set of questions consisted of three general questions: 1. What motivational strategies do you find most effective? 2. Please try to characterize the students with whom you need to use alternative strategies? 3. What the biggest obstacle you encounter when trying to motivate students to learn? Each general question was followed by comments or more questions to delve further into the interviewees answer. The techniques identified in responses to question 1 were classified into categories identified by Brophy (1987).

Concept mapping was utilized to analyze and display the data collected. Maps were constructed after classifying participant responses into general categories, these categories are broken down into more specific secondary categories or the specific responses. These secondary categories are then broken down further into the specific responses. The size of all of the categories and responses is determined loosely on how often they were mentioned by the participants. In some cases there are relationships between categories, those indirect relationships are also included on the maps.

Results:

Responses to the first general question are illustrated in Appendix. The responses fell into three separate categories, stimulating student motivation to learn, supplying extrinsic motivation, and capitalizing on students' intrinsic motivation to learn. The category most often cited is capitalize on students' intrinsic motivation to learn. Most of the responses in this category belong to a secondary category, cooperative learning techniques

The responses to the question of, what student characteristics require customization of motivational strategies, were classified into six categories. The categories are: socioeconomic status, learning styles, gender, personality, academic levels and out of school stresses.

Academic level was mentioned most often as a factor that teachers customize for. One participant explains the problems motivating lower level students, these students "tend to have less scholastic motivation, are less interested in their GPA., are more interested in marking time, and are not interested in how well or poorly they are doing, and as a result there are more disciplinary problems." The same participant uses more active and hands on activities with lower level students. Other techniques participants found effective with lower level students include, creative projects, calling home with praise and celebrating individual success. The techniques identified as more effective with higher level students were creating competition between classes and emphasizing grades.

The five obstacles to motivating students were identified as apathy towards education, out of school stresses, chronic absenteeism, lack of a larger goal and lack of interest in topic (see Figure 3). The most often cited obstacles are apathy and out of school stresses. Two different causes of student apathy were identified, society and family. Familial apathy towards education was more frequently cited. The effects of societal apathy are expressed by one participant here: "I think a lot of kids want to do well, and succeed and its just not cool."

Implications:

The frequent agreement for several of the factors indicates that there are some elements that are common in science classrooms. The range of responses and occasional contradiction indicate that many of these factors vary from teacher to teacher. It appears that cooperative learning is an extremely effective way to motivate students and with patience it is effect for all levels of students. It also is evident that teachers focus primarily on ability grouping when customizing their motivational techniques to better fit the group of students with whom they are dealing.

In order to more effectively motivate both of the above results must be considered. Teachers will become more effective motivators as the increase the variety of motivational techniques they employ. Another way teachers can more effectively motivate their students is to make sure they choose techniques that are not of the same type. It is important if teachers are to reach all of their students to employ techniques that do not depend on any one category of strategies (capitalizing on students' intrinsic motivation, extrinsic motivators, stimulating student motivation to learn, and maintaining student success expectations).

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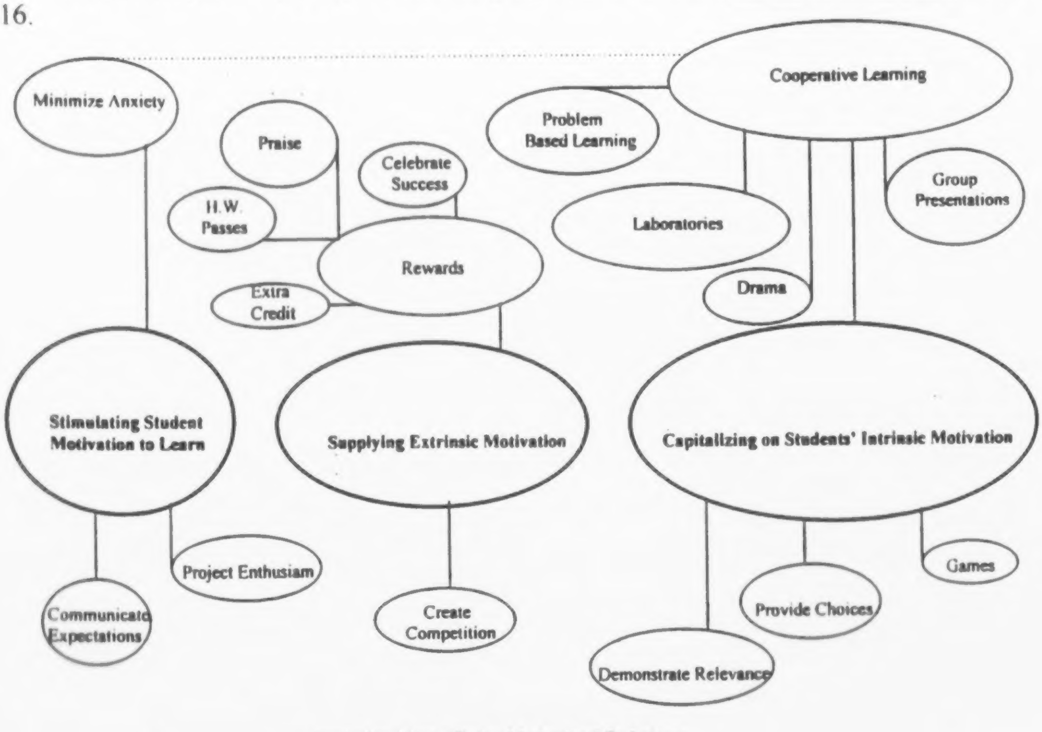

Appendix: Most effective Motivational Techniques

Problem-Based Learning and Student Ability Level

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December, 1996

Introduction

Problem-based learning is a teaching methodology where students solve realistic, complex problems. The problems are structured in such a way that they do not have a single, correct answer and the students are then asked to hypothesize about and research the problem in order to develop the best possible solution. A teacher using problem-based learning plays the role of facilitator so that the responsibility for learning is the students' and the decisions concerning the problem are also the students'. The most important thing problem-based learning seeks to do is develop students' higher-order thinking; the technique is designed to enhance the ability to apply knowledge creativity and effectively. Problem-based learning got its start in medical schools, where it was felt that graduating doctors (who presumably were among the top science students in the nation) were coming out of medical school with a library of facts in their brains, but an inability to use those facts well. While this fostering of higher-order thinking would seem to be desirable in students of all levels, is it realistic to think that problem-based learning is appropriate for both the standard and honors level secondary science students? To help answer this, this study seeks to determine how suitable problem-based learning is for students of different ability levels and how, when using problem-based learning, the teachers adapt the process to suit these different students.

Literature Review

Researchers dealing with gifted students have been, for years, calling for the fostering of higher level learning that problem-based learning is designed to achieve (Stepien et all, 1993, Barell, 1984, Isaksen, 1993, Johnson and Ryser, 1996, Maker and Nielson, 1996). Some studies stress the importance of this for gifted students, but agree that these higher-level thinking skills should be deveoped in students of all levels, while reserving highly independent study and rapid pacing for gifted students (Maker and Nielson, 1996, Johnson and Ryser, 1996).

The group work required in problem-based learning seems better suited, according to some researchers, for regular level students than honors because gifted children tend to be more independent and mistrustful of others' ideas (Ricca, 1984, Robinson, 1990, Li and Adamson, 1993). However the need for honors students to learn to work cooperatively was also recognized (Slavin, 1990, Robinson, 1990).

Aside from group work, researches advocate using certain other methodologies with higher level students. Individualized instruction is suggested for gifted students (Johnson and Ryser, 1996, Burkman et al, 1982). The necessary classroom structure indicated by the research is consistent in that a lower degree of structure and a lower number of explict tasks is recommended for honors level students (Griggs and Dunn, 1984, Maker and Nielson, 1996, Ricca, 1984, Johnson and Ryser, 1996). These studies suggest trends to look for in the teachers' responses to the questions asked during the interviews.

Methodology

The subjects of the study were eleven (11) secondary science teachers in North Carolina who had varying degrees of experience with problem-based learning. They were interviewed using a loosely structured format to encourage conversation. For the purposes of comparison, however, the teachers were explicitly asked the following six questions during each interview: 1. What are some aspects of problem-based learning that went better than expected with your honors level students? 2. What are some aspects of problem-based learning that went worse than expected with your honors level students? 3. What are some aspects of problem-based learning that went better than expected with your regular level students? 4. What are some aspects of problem-based learning that went worse than expected with your regular level students? 5. How did each ability level perform and function in the group work required in problem-based learning? 6. Do you think problem-based learning is better suited for one ability level or the other? The interviews were tape-recorded and then transcribed.

Results and Discussion

Nine out of the eleven teachers specifically mentioned that more structure was needed in the standard level classroom than honors, and there were two major reasons for this. One, more structure was needed in the regular level classroom to maintain discipline and ensure students spent time on-task. In addition, the regular level students were more likely to become frustrated with the problem and give up as they didn't know quite what to do unless their teacher assigned them specific tasks.

As seen by the teachers, the major benefits of problem-based learning to the two levels were quite different.. Eleven out of eleven teachers noticed that their standard level students became more involved and more interested while using problem-based learning and believed this to be the most important aspect of the method; many students who traditionally have been hard to motivate became engaged in the work. Only two teachers mentioned this particular benefit regarding their honors students. The benefit most discussed for the honors students (six teachers specifically spoke of it) was that they were able to achieve great depth in their learning, more so than in a traditional lecture unit.

Problem-based learning, by its nature, involves real world problems and this arms the teacher with the answer to the question, "When am I ever going to use this?" This real world motivation seemed more important, though, for the standard level students as seven teachers noted this rationale was especially helpful in motivating them. A common sentiment among these teachers was that the honors level students, who are more internally motivated, would learn the material regardless of the method used, while this was not felt to be true, generally, of the regular level students. No teacher stated that he or she felt the rationale more important for honors level students.

While the literature review suggested that honors level students are hesitant about group work, this was not found to be the case in this study. Nine of the eleven teachers felt that the honors students performed better in the group work, primarily because they stayed on-task more than their standard level counterparts. Competitiveness among the honors students was noted, but the teachers who talked about it thought it enhanced students' learning. The students in the standard level classes, however, were apt to try and push off all of the work to one student or sit around waiting for another to take the initiative. Group leaders appeared not to be chosen by intelligence, as the teachers who commented on this felt personality traits of one form or another were the most important factor in determining a group leader.

Another significant finding was the belief that problem-based learning is valid for both levels. Eight of the eleven teachers thought that problem-based learning benefited both groups equally, while one teacher thought it worked best with the standard level students. The two remaining teachers, who thought problem-based learning was perhaps best suited for honors students, still felt the technique had a lot to offer the standard level classes. All eleven teachers felt problem-based learning to be suitable enough for both levels of students that they all plan to continure and/or expand their usage of it.

The teachers in this study adapted their use of the method to fit the students they were teaching. However, as they all felt the concept of problem-based learning was useful to students of both levels, the teachers still were able to foster the student-directedness, student responsiblity, and freedom that make problem-based learning a valuable method for them.

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The Effect of Teacher Prompts on Gender and Comprehension

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Introduction

There is a consensus in the academic field that females and males comprehend written material differently. This inference has many implications especially in the propagation of the status quo mentality that exists in today's society. One frightening aspect of this assertion is that although researchers have concluded that males and females comprehend differently, little research has been conducted to show ways in which this difference could be lessened. As a future teacher, it greatly interests me to determine methods that teachers can to use to diminish any differences that exist in the way their students comprehend written material. I propose to determine if the prompting by teachers has an effect on the differences in comprehension by male and female high school students. In order to study comprehension, I will look specifically at the ways in which students respond to literature in both a written and oral manner.

Review of Literature

The theoretical model of readers' response to literature developed by Louise Rosenblatt (1978) proposes that the literary experience produced during reading is a result of the transaction between the reader and the text. Rosenblatt (1978) suggests that the reader approaches a text from either an efferent stance (reading for information) or from an aesthetic stance (giving attention to what one is experiencing, thinking, and feeling while reading).

Milner and Milner (1993) has developed a method where Rosenblatt's reader response theory can be used in the classroom. They recommend four stages for students to move through while using the reader response process. Students should initially respond to the literature in a personal manner before they receive any explanation from outside sources. Students should next share their reflections with each other within the classroom environment. Students then enter the stage of formal analysis where they begin to reflect on formal dimensions of the work. Finally students other critical viewpoints of the text and formulate their own viewpoint. Cothern (1993) asserts that when this type of strategy is used the reader response process works at an optimum and affirms the importance of response to students.

There are problems associated with the use of reader response process in the classroom. Probst (1991) asserts that teachers have problems utilizing reader response theory because students are unaccustomed to the idea that there are several "correct" responses. To overcome this, teachers should encourage students to spend time with texts and become "problem makers" rather than "problem solvers" (Leggo, 1991). Students should be encouraged to ask questions rather than state facts; this will encourage students to more thoroughly engage the text. Sebesta (1995) and Flood (1993) address the difficulty of teacher assessment of student reader response. Both suggest that by using a hierarchy such as Milner et al.'s (1993), teachers can document in which stage students are and document their reader response development.

Durrant, Goodwin, & Watson (1990) found that oral responses in a social (classroom) setting are better than individual written responses. When writing a response, students feel the need to write a final definitive response rather than explore all of the possibilities of literature which occurs most often when discussing a work orally. Durrant et al. (1990) assert that because of this, a response can be enhanced if it is first discussed aloud in class. Schraw and Dennison (1994) found that the student's response is further enhanced is they are given a prompt by the teacher concerning what to look for in the text before they read the text.

There is much concern about the role that gender differences play in the reader response process. By looking at gender-typing and reader response, researchers were able to conclude that responses can be generalized as representing a masculine or feminine point of view (Chaffin Crawford, 1986). Although researchers agree that males and females respond differently to literature, there is much controversy over the ways in which the two groups differ. Chaffin et al. (1986) explain that this controversy exists because women are taught to read against themselves; therefore, it is often hard to come up with reliable differences because females tend to adopt male viewpoints. Despite this debate, there has been some consensus on the manner in which females and males differ in their responses. Research indicates that the female reads against herself and the male displays stereotypical masculine attitudes (Young, 1993) despite any gender-type assigned to them. Males display a tendency to reject or dominate disturbing stories, whereas females achieve a critical detachment (Flynn, 1983). Yet, Young (1993) found that when the protagonist of a story is female, males are more likely to be detached from the text and defend their gender. Flynn and Schweikart (1986) assert that males move from responding to parts of the story to the entire story, they are more detached from the characters and their situations, and they respond to discover for themselves, rather than inform an audience. Females react emotionally as well as intellectually and have a closer connection to the characters about whom they are reading (Flynn et al., 1986). Bleich (1986) looked at the way in which men and women differed in their perception of voice in pieces of literature and the way in which males and females retell a story. He found that men perceive a strong narrative voice, assume that the novel is the result of the act of writing, and explain its meaning in relation to this assumption; males understand the narrative through the writer's eyes, while females understand it through the readers' eyes and tend to identify with the characters. Females tended to empathize with the characters and effectively related theme and setting in the stories.

Methodology

To test my theory that the prompting of students by high school teachers can have a positive effect on the ways in which students respond to literature, I performed a qualitative study. For two months, I observed six high school English classes at East Forsyth High School, Winston-Salem, NC. These classes consisted of two senior college preparatory classes, two freshman advanced honors classes, and two sophomore advanced honors classes. Each class contained approximately 20 to 25 students and represented girls and boys equally. During my observations, I noted the ways in which the students responded orally to literature, any prompts that the teacher used to facilitate this process, and any gender differences ensuing out of their responses. In addition to my classroom observations, I performed an experiment to discover the manner that students responded to literature in writing. Both freshman advanced honors classes read Edgar Allen Poe's "The Masque of the Red Death." One class (which I will call Class A) was instructed to read this story and then respond to it on their own for homework by answering the questions, "What is your reaction to 'The Masque of the Red Death,' and what do you think that Poe was trying to accomplish with this story?" Class A turned in these assignments the next day. The other freshman English class (Class B) read the story for homework and the following day had a teacher led class discussion about Poe's story. They were then instructed to write for homework a response answering the same question as the other freshman class and turn it in the next day. Of the students in Class A, I received sixteen responses, of which six were written by boys and ten were written by girls. From Class B, I received fifteen responses; seven were written by boys and eight were written by girls. Between the two classes, I did not receive responses from seven students.

At this point, I would like to differentiate between two types of teacher prompts: An open ended prompt and a leading interpretative question. Both prompts ask information from the students; yet, the open-ended prompt does not lead the student to any preconceived idea. The leading interpretive question asks the student to think of an aspect of the story that he or she may not have thought of before. For example, a leading interpretative question would be "Why do feel that there was a black room in Poe's story?" An open ended prompt would be the question "what is your reaction to the story?" This does not lead the student to focus on any one aspect of what he/she is responding to, but enables the student to respond at will.

Results and Conclusion

Of the writing samples I received from Class A and Class B, I found that boys and girls did respond differently before and after the teacher-led discussion which included leading interpretative questions. Students in Class A did not write as long of a response as those in Class B. In Class A, the girls tended to write less than the boys, they averaged a quarter to a half of a page whereas the boys averaged almost an entire page. The girls were more willing to say they didn't understand the story and leave it at that. I received one response from a girl that had written: "My reflection to this short story is that I don't understand it. Therefore, I do not know what Poe is trying to say" (end of response). Two other responses from females were similar to this one. Of the girls that did respond further than the above, they displayed a tendency to question themselves more often than boys, one girl responded, "I know for a certainty that the masque itself represents something to do with a new identity...well I don't know." And many girls used tag questions by making a statements and then adding "Am I right?" Another girl began her response by stating: "I enjoyed 'The Masque of the Red Death.' (what I could understand of it??)" and then gave a very thoughtful analysis of it showing that in actuality she did understand it. Both boys and girls in Class A addressed the story from Poe's viewpoint. However, when the girls mentioned Poe, they mentioned him in the context of what he was trying to do to the reader: "Poe tries to get you scared and make you think that something like that could happen to you." Boys tended to attack Poe personally if they did not understand what he was doing; many boys wrote responses such as " I believe this Poe guy is really sickening...he is a little wacko." Like the girls, boys in Class A tended to say that they did not understand the story; yet the boys appeared more willing to discuss the story and try to figure it out.

In Class B, all students appeared more willing to discuss the story. The average page length for both genders was one page with most being longer than that. The majority of the students began their papers with a common analysis of the story: "I think Poe was trying to say that you cannot escape your destiny." They then followed this with further interpretations and implications that this story may have on their lives. All students discussed the story in terms of death and how they felt about it. Both boys and girls admitted that they were afraid to die or that they did not like the idea of death, but that one had no choice and must accept it. More girls in class B were willing to state that they liked the story than the girls in Class A and the boys in either class. Girls from Class B also tended to discuss the main character of the story, Prince Prospero, and state the way they felt about him. Boys from Class B still did not seem to like the story after the discussion and attacked Poe's personal life almost more often than the boys in Class A. Several of the statements were "he was a drunken slob addicted to opium," "Poe was a trippin' old man and wrote some freaky tales," and "Poe is for the drunk and the sick." I will note that although students were informed by the teacher that Poe had a drinking problem and a "small drug problem" no more was said about the subject. The boys drew the conclusions that "Poe wrote these stories when he was high" for themselves. None of the girls in Class A or B attacked Poe in such a manner. Several of the boys in Class B suggested ways that Poe could improve his writing: "He could have done this easier" and "It would be a better story if the words were not so long." Girls were more willing to accept that the difficulty of the story added to the story: "Poe uses hard words, but I guess that is what makes the story so good."

Of the oral responses that I observed. The most remarkable feature appears to be in looking at which actually responded in class. Girls tended to raise their hands more often and were called on more often. In two of the classes, the teacher never called on students unless they raised their hands and the boys never raised their hands. In these two classes, boys did often contribute insightful information but did so by interrupting others or calling out loud without raising their hands. Boys also showed a tendency to make jokes in class, whereas girls did not.

In all of the classes, boys were more willing to interrupt students or to correct their fellow classmates.

Although the oral responses were not conclusive for this study, they appear to have implications for the study of classroom participation styles of boys and girls. The written response experiment is much more conclusive. Boys and girls still responded differently after the teacher led discussion using leading interpretative questions, yet the differences were not as large as the class where students did not receive a teacher led discussion. Both genders in Class B were more willing to engage the text and write more thoughtful. Those students who wrote responses which exhibited not as insightful replies[1] actually reversed after the teacher led discussion: girls in Class A were not as insightful because they did not often try to engage the text and frequently gave up; boys in Class B were not as insightful because they chose to attack Poe more often after they had discussed the story in class. It appears as though classroom discussion does blur many of the gender differences in readers' response to literature and leads to both genders more thoughtfully engaging the text.

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[1] By the term "not as insightful replies," I am referring to replies that either did not answer the question asked or answered it in a noncharacteristic manner.

Using the Weather Channel as a Teaching Tool for Geography

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Introduction

Unique and alternative teaching methods are constantly being sought for teaching the social studies. Geography, an intricate part of the social studies, has benefited from this quest for innovative teaching tools. Using television and CD ROM are examples of new, modern methods of teaching geography. *The Weather Channel* is a combination of both media sources. With the growing interest in weather and its phenomena, the social studies field must grasp this public curiosity and build upon it. Children can watch television and learn at the same time. Using *The Weather Channel* as a teaching tool not only aids visual learners but places geography and meteorology instruction into the modern era of computers, television, and video.

Problem:

Is *The Weather Channel* an effective tool for teaching geographic location ability and meteorological knowledge to high school students?

Review of Literature

There is a need for alternate instructional methods in the social studies. According to Martorella, most students have trouble comprehending social studies textbooks. With difficult vocabulary, sentence style, complex data tables and concepts, textbooks must not become the only teaching tool in the social studies. Teachers must aid in the comprehension of the subject through journals, advanced organizers, research reports, and using the media (Martorella 1990). One specific teaching tool is television. Japanese teachers have begun to develop lessons using television. One study revealed how Japanese students, in their aim to identify how traditional methods of well digging occurred before modern technology, used television as a source to learn the concept (Saga 1993).

This need for alternative and unique teaching tools also extends into the field of geography. Along with textbooks being extremely complicated for students, traditional teaching methods for geographic skills have been found to be unsuccessful at times. In a study on place knowledge of African countries, high school students were given three traditional ways of learning maps: a textbook map, an outlined map with spelling of place names not memorized, and an outline map with spelling of the place names memorized. None of the three treatments were satisfactory in aiding students' location ability (Burson 1977). Television can serve as an alternate method of teaching geographic location. Like the Saga study on Japanese students, television has been used in the United States as an instructional method in place geography. Television shows such as M*A*S*H have been found to be a successful tool for teaching geography. Frequent viewers of the television show discovered that their place perceptions and their mental maps of the United States were expanded or enriched. Because the show has been recognized for its quality of geography content, M*A*S*H has also been claimed as a resource for teaching geographical concepts (Collins & Sawyer 1984).

Television offers an untextual approach to learning geography. Besides television shows, the news, specifically weather forecasts, have also been found to aid in geographic and meteorological instruction. A study on weathercasts revealed that television weather news provides a significant amount of geographic information. It was discovered that weathercasts can teach the general public about meteorology as well as students enrolled in geography classes (Earl & Pasternack 1991). In summary, there have been some recent studies on television and its use as a tool in social studies classrooms. Concurrently, it has also been found that weathercasts on television can be effective in teaching people about meteorology. Thus, it seems plausible to make an attempt to use *The Weather Channel* as a teaching tool in order to increase not only a student's ability to locate places on a map, but also his or her knowledge about the weather in general.

Methodology

Subjects:

The subjects of this study were honors level, ninth grade students and honors level, eleventh grade students in four social studies classes at Reynolds High School in Winston-Salem, NC. A total of eighty students participated in the study. The treatment group consisted of forty-one students which included Mr. Doug Illing's ninth grade honors ELP class (1st Period) and Mrs. Martha Deal's eleventh grade honors U.S. History class (2nd Period). The control group consisted of thirty-nine students which included Mr. Illing's ninth grade honors ELP class (5th Period) and Mrs. Deal's eleventh grade honors U.S. History class (5th Period).

Procedures:

The study was conducted November 12-15, 1996. A pretest and a posttest were given to all eighty students. Both the pretest and posttest were identical. The test contained twenty-five questions. The first fifteen questions dealt with geographic location knowledge and the last ten questions dealt with meteorological knowledge. On Tuesday, the students in all four classes took the pretest. On Friday, all four classes took the posttest. For approximately four days, a videotape of *The Weather Channel* containing the local and national weather for that specific day was shown for approximately twelve to thirteen minutes to the treatment group. The treatment group viewed *The Weather Channel* for a total of fifty minutes.

Analysis:

Analysis of Covariance was used to determine the effect of treatment on the post geography scores. To control for initial differences, the covariant was the geography pretest scores. Three separate ANCOVA's were calculated to determine the effect on total geography achievement, location ability, and weather knowledge.

Results and Conclusions

Results:

Means and standard deviations of all variables are presented in Table 1. There appeared to be little difference in pretest scores for the two groups. The ANCOVA procedure partially controlled for the differences that did exist. The treatment group scored higher on all post measures.

Results of the ANCOVA for total geography achievement score, controlling for initial location and weather knowledge scores, revealed that the treatment group scored significantly higher on the total geography posttest. ($F (1,79) = 51.03$, $p < .05$). See Table 2.

Table 1.

Means and Standard Deviations of Variables

	Experimental		Control	
	Mean	S.D.	Mean	S.D.
Total (Pretest)	17.37	4.67	17.05	3.58
Total (post)	20.78	3.74	16.72	4.60
Location (Pretest)	11.22	3.26	10.87	2.53
Location (post)	12.07	3.02	10.59	3.20
Weather (Pretest)	6.12	2.48	6.18	2.18
Weather (post)	8.29	1.95	6.13	2.51

Table 2.

ANCOVA Table for Total Posttest Scores

Source	SS	df	MS	F
Group	288.61	1	288.61	51.034*
Pretest (Covariate)	927.47	1	927.47	164.001
ERROR	435.46	77	5.66	
Total	1651.54	79		

*Significant $p< .05$

Similarly, the treatment group scored significantly higher on Location Questions (F (1,79) =5.48, $p< .05$) and on Weather Questions (F(1,79) = 36.71, $p< .05$). See Tables 3 and 4.

Table 3.

ANCOVA Table for Location Posttest Scores

Source	SS	df	MS	F
Group	29.536	1	29.54	5.48*
Pretest (Covariate)	339.54	1	339.54	63.05
ERROR	414.68	77	5.39	
Total	783.76	79		

*Significant $p< .05$

Table 4.

ANCOVA Table for Weather Posttest Scores

Source	SS	df	MS	F
Group	96.96	1	96.96	36.71*
Pretest (Covariate)	187.46	1	187.46	70.97
ERROR	203.38	77	2.64	
Total	487.80	79		

*Significant $p< .05$

Conclusions:

The problem which this study sought to answer was if *The Weather Channel* could be used to teach geography to high school students. The data indicated that the answer was "yes." The group which received the treatment, watching *The Weather Channel* for fifty total minutes over a four day period, scored significantly higher on the total geography posttest than the control group which did not receive the treatment. The Analysis of Covariance found that the posttest means were significantly higher in the treatment group for each subgroup. Since the treatment group separately scored significantly higher on the location questions as well as the weather questions, it appears that using *The Weather Channel* has a positive effect on overall geographic location ability and meteorological knowledge.

This study did have its limitations. The sample group consisted only of "honors" level students. Similar results may not occur with higher or lower level students. Higher level students may already have a better working knowledge of the weather and location geography while lower level students may not have the patience nor the comprehension skills necessary to learn from *The Weather Channel*.

Because the study used an alternate or different treatment, the danger of the Hawthorne Effect could also be a factor on the success of the treatment group. The treatment group's scores could not have totally been a result of the treatment, but could have partially resulted from the group's knowledge of being in a study or from the mere novelty of having to watch *The Weather Channel*.

In conclusion, using *The Weather Channel* to teach geography has a positive effect on high school "honors" level students. This study found that students' geographic location ability and meteorological knowledge improved. Thus, the implications of this study are that *The Weather Channel* should be used as a teaching tool for geography in the high schools.

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Learning Style Perceptual Strengths in the Mathematics Classroom

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The study of human cognition has been a subject of interest for centuries. Hypotheses about how humans think and what makes their thinking patterns different from those of others can be traced back to ancient Greece, when Galen proposed his four "humors." Adler noted how Hippocrates later expanded upon Galen's ideas through Hippocrates' philosophy of the four temperaments: choleric, phlegmatic, melancholic, and sanguine (as cited in Ansbacher & Ansbacher, 1959). Although this notion of humors affecting temperaments may seem antiquated today, the desire to understand the influences and uniquenesses of the human thought process is certainly not at all archaic as the more current research on this topic has been as diverse as it has been abundant.

As a researcher in this century, Piaget made significant advances in the field of understanding human cognition through his proposal of a model for the development of behavior and thought patterns of children and adolescents (Piaget & Inhelder, 1969). Maclean later proposed a more primeval and biological model of how people think (as cited in Hart, 1983). Perception of reality was something that Alfred Adler was interested in as well (as cited in Ansbacher & Ansbacher, 1959). He was especially struck by the remarkable uniqueness of the style with which the children he studied approached the world around them. "The child perceives in his environment only that which for some reason fits his previously formed uniqueness" (p. 210). As far as the learning process was concerned, Adler postulated that "There are hardly two people who will make the same practical application of one and the same experience" (p. 212). Dunn, Dunn, and Treffinger considered these differences in learning styles to be common sense: "Every parent knows that every child is different from every other (1992, p. vii). Similarly, "Well-designed and well-conducted research studies verify that, regardless of age, I.Q., socio-economic status, or achievement level, individuals respond uniquely to their immediate environments when they are trying to learn something new--particularly if it is difficult" (Dunn, 1981, p. 31).

McCarthy (1987), in her research on learning styles, concluded that there are two main facets of the learning process: the ways we perceive things around us and the ways we then process what we perceive. These two factors have also formed a basis for the research of numerous others interested in learning style theory. (Barbe & Renzulli, 1981; Jung, 1971; Kiersey, 1987; Kolb, Rubin, & McIntyre, 1971; Lawrence, 1979; Myers, 1962; & Tobias 1996). All of these researchers drew conclusions along the same lines, showing that there are differences in how people perceive and process information.

One of Guilford's conclusions from his research (as cited in Barbe and Renzulli, 1981) was that learners are not "stimulus-response devices," but that each learner is an "agent for dealing with information" (pp. 100, 101). Guilford disagreed with the notion that all minds are like machines that work in the same way with the same input. He, like the other researchers already mentioned, felt that people deal with information uniquely through the use of a personal "style," and not according to the same standard procedure.

One of the most extensive reports on learning styles was by Dunn, Dunn and Treffinger (1992) who found that there is unique combination of learning style characteristics that determine how a person feels most comfortable learning, and how a person will learn most effectively: "We don't need [our optimum learning style situation] for easy to understand information but we must have it for difficult information" (p. 18). Thus, a person's learning style is a crucial part of satisfactory learning, as is also demonstrated in other research (Dunn, 1981; Midkiff & Thomasson, 1993; & Smith 1985).

There are tremendous implications for this in the field of education. Lembo, in Why Teachers Fail, wrote that an "assumption . . . about human learning and development is that there is a single process which is appropriate for all learners," and that many educators believe that all learners should "be guided through the same content at the same time in the same way" (1971, p. 11). A similar statement was made by Fenstermacher and Soltis: "Often when new teachers plan their instruction, they have in mind some prototypical student, someone like themselves perhaps . . . This conception of the prototypical student usually shapes the way a new teacher plans to teach [a given subject]" (1986, p.24). This "prototypical student" image has shaped a lot of educational standards and strategies, which has led to a favoring of certain types of students (Dunn, 1981; Lawrence, 1979; & McCarthy, 1987).

For these reasons, in order for the giftedness in each child to be capitalized on in a classroom so that teaching is effective for all students involved, a teacher must be sensitive to each student's individual learning style, and attempt to personalize instruction to meet those needs (Dunn & Dunn, 1972). This perspective relates directly to the field of mathematics instruction. "It is highly possible that individuals who achieve well in math are being taught in ways that best meet their learning preferences; and if math teachers would change their instructional strategies for low achievers to match their preferred learning styles, it is likely that there would be fewer low achievers in math" (Dunn & Dunn, 1978, p. 399). If students truly learn most effectively "only when they use their learning style characteristics advantageously," as opposed to studying and then forgetting what they tried to learn when other styles are implemented, then it is essential for a teacher to try to individualize instructional styles to meet the needs of the students in his or her classroom (Carbo, Dunn, & Dunn, 1986, p. 2). This attempt must be made in order to effectively prepare students for a world in which they need to have a good foundation in mathematics (Midkiff & Thomasson, 1993; Young, 1923).

In light of this, the present research was an attempt to continue the investigation of the outcomes of using learning style-based instruction in the mathematics classroom. The purpose was to verify the effectiveness of this type of approach in facilitating mathematics achievement and comprehension. It was hypothesized that if students are taught mathematical concepts through the means of their strongest individual perceptual channels, whether those be auditory, visual, tactual/kinesthetic, or a combination of these three, then those students will be the ones who will achieve the most in a given math class. Conversely, it was also hypothesized that those students whose perceptual channels are not acknowledged and validated through their teachers' specific teaching methods will be the least academically successful in their math classes.

Methodology

Subjects

The subjects for this study included 87 students and two teachers from four average- and honors-level high school mathematics classes. These classes were from two schools and contained students who varied by grade, gender, and socio-economic status.

Measures and Procedures

A Perceptual Strengths Questionnaire (Dunn, Dunn, & Treffinger, 1992; McCarthy, 1987; and Tobias, 1996) was administered to all students in both classes to assess the learning styles of each student. Observations were made using a checklist to quantify the number of times the teachers used visual, auditory, or tactual/kinesthetic cues in their instruction. Students' grades for the marking period under study were collected.

Analysis

The results of the questionnaire, student grades, and the instructional techniques of the teachers were compared to see if there was a relationship between the students' learning styles, the level of their academic achievement in class, and the teachers' teaching methods.

Results and Conclusions

The data collected from this study was tabulated and the means, standard deviations, and a Pearson correlation matrix indicated the lack of significant relationships between any of the variables involved. There are many possible reasons for this. One of the most probable reasons would have to do with the self-assessment method used for determining student learning styles. Some students tended to see themselves as best able to learn under almost every circumstance presented on the questionnaires, while other students saw themselves as always having difficulties, with high grade and lower grade students in each group. Perhaps the students were unable to assess themselves accurately as at this age they may not be as familiar as they would need to be with the self-report format to make this type of study very profitable. It may be worthwhile to find another means of assessing students' learning styles, perhaps through individual interviews or another type of hands-on controlled experiment for example, before performing this experiment again. Educating students first on the different types of learning style perceptual preferences might also be a helpful option.

The questionnaire itself may not have been the best one to use in a self-report situation. Perhaps there are better questions that could be asked to discriminate between learning styles in a more effective way. As it was, many of the questions were set up so as to detect combinations of learning styles. Maybe having questions that only relate to one learning style at a time would be more beneficial and discriminatory. Also, some of the questions may not have been as relevant to high school students as they would have been to younger students. Revising the questionnaire, then, could have brought about different results and perhaps shown significant relationships between some of the variables.

Another approach to revising this experiment may involve controlling for the teachers' teaching styles. The two teachers observed incorporated all three of the teaching styles into their lessons pretty thoroughly. If this were a more controlled setting where teachers only taught in one specific way, such as only visually, for example, over a given period of time, perhaps students' grades and perceptions of how they are best able to learn would both be influenced. Since this was not controlled for but was only observed in this experiment, it may prove to be an interesting factor to manipulate for in future research.

While the lack of significant correlations in this study does not single-handedly negate any influence of learning style perceptual preferences on students' academic success in mathematics classes, it does lead to some interesting conclusions. If the questionnaires did present a valid assessment of students' learning styles, then apparently there are other factors involved that influence students' grades. According to Dunn, Dunn & Treffinger (1992), there are many additional variables that can contribute to a person's unique learning style in addition to perceptual preference(s), such as time of day, lighting, social context, seating arrangement, and others. Any of these would be worth investigating to see if they do in fact indicate having a significant relationship to students' grades, and if considering them can help students understand and learn more effectively--and achieve more academically. After all, effective learning by students should be one of the highest priorities of those involved in the field of education.

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Exploration of Student Knowledge of Ethical Issues in Genetics

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Introduction

Genetics has advanced rapidly over the past thirty years, and significant ethical dilemmas have accompanied these rapid advances. Medical advances, involving genetic testing and genetic engineering, have raised ethical debates over confidentiality of genetic information, and over abortion based on fetal genetic information.

Monumental advances in genetics will likely occur over the next fifty years. The completion of the Human Genome Project, a worldwide effort to unfold the nucleotide sequence of human DNA, promises to revolutionize medicine and genetic applications. Current ethical dilemmas will pale in comparison to those of the future. Americans will encounter issues of genetic discrimination, such as employment discrimination based on genetic predispositions to disease (White & Caskey, 1988). Furthermore, Americans will face issues in genetic enhancement, including the determination of the ethical boundaries for the modification of the human genome.

Without sufficient knowledge, Americans may make harmful ethical decisions. The public appears skeptical of advancement in genetics because there is widespread unawareness of all its benefits, and because there is no tradition of ethical discussion on issues in genetics (Heyd, 1992). Genetic research may be threatened by public ignorance. Keeping up with genetic progress will challenge the general public, and education may be the answer in preparing Americans for genetics in the twenty-first century.

The purpose of this study is to examine the level of student knowledge in basic human genetics, and the source of influence on students' ethical decision-making in genetics. Furthermore, the study explores teachers' application of human genetics and ethics in their classrooms.

Review of Literature

American high school students generally possess limited knowledge of basic human genetics (Ahmed, 1996; Mertens & Hendrix, 1990). Modern genetics education can be effectively incorporated into the standard high school biology curriculum, and can increase student interest and achievement in genetics (Ahmed, 1996; Moore et al, 1992). Furthermore, basic human genetics serves as a prerequisite for bioethics education in genetics.

Numerous educators promote bioethics units in genetics to help students encounter ethical issues and clarify their values, and believe that such units are essential in preparing students to face ethical dilemmas in these students futures (Blake, 1994). The incorporation of bioethics units can enliven the curriculum, and captivate students (Mertens & Hendrix, 1982). Also, these units may have positive effects on achievement in genetics, while promoting students' critical thinking (Armstrong & Weber, 1991).

The ultimate success of bioethics units in high school biology hinges on the teachers' experience with bioethics instruction. Biology teachers often do not have experience teaching ethics, and encounter difficulties in obtaining teaching resources for ethical issues (Cross & Price, 1996). Furthermore, teachers feel obligated to meet the content requirements set by the College Board, and thus, sacrifice coverage of ethics in the curriculum.

A possible solution to teacher difficulties involves a revamping of teacher education programs. Mertens and Hendrix (1988) recommend required teacher training in human and medical genetics and in methodologies for dealing with controversial issues for preservice teachers, and required workshops for inservice teachers. Several workshops have been developed over the past ten years, including the Genethics Program of Ball State which generated significant immediate and long-term gains in genetics and ethics knowledge among its participants (Mertens & Hendrix, 1988; While et al, 1987).

Sources outside of high school can influence adolescents' views on bioethical issues, and often impose negative biases on adolescents. The media has recently supplemented its traditional factual coverage of science with biased coverage which emphasizes the negative impact of science and technology on society (Peters, 1995). The general public and religion often oppose advancements in genetics, particularly in genetic engineering, and thus, parents and church can negatively influence adolescents' bioethical decision-making.

Methodology

The participants in this study were 222 students (123 female and 99 male) and 10 teachers from four high schools, three in Forsyth County, North Carolina, and one in

Columbia County, New York. All students had completed regular or honors biology prior to the study, while all teachers taught general or honors biology.

The materials were two questionnaires. A *Student Questionnaire*, of 14 questions, determined the extent of student knowledge in basic human genetics, and the extent and source of student knowledge on ethical issues in genetics, while a *Teacher Questionnaire* of 10 questions determined the amount of coverage of ethical issues in high school biology. Student data was collected during human anatomy or mathematics classes at the four high schools, and the questionnaire took fifteen minutes to complete. Teacher data was collected during the teachers' free periods, between classes, or by mail, and the questionnaire took five minutes to complete.

Results

Responses for questions one through four on the *Student Questionnaire* , which covered DNA fingerprinting, genetic diseases, genetic engineering, and the Human Genome Project respectively, indicated a low level of basic genetics knowledge. Only 7.2% of students correctly described genetic engineering, while 36.9% and 41.9% understood DNA fingerprinting and the Human Genome Project respectively. For questions one through four, a cumulative total of 303 responses indicated sufficient knowledge in basic genetics, while 585 responses indicated deficiencies in knowledge.

Questions five through ten on the *Student Questionnaire* assessed the source of influence on students' ethical decision-making for issues related to genetic considerations in health insurance, gene therapy, genetic enhancement, genetic modification of plants and animals, genetic testing of adults, and genetic testing of fetuses. The combined totals for major source of influence were 213 responses for school, 174 for media, 155 for parents, 64 for church, 62 for friends, 173 unanswered, and 491 for "Other." Question 13 which asked students to determine the most important influence yielded school (n=109), media (n=61), and parents (n=24) as the major sources. The teachers' perceptions of the major source of influence on adolescents' ethical decision-making deviated from the actual influential sources, as revealed by students, with five teachers indicating media, four indicating parents, and only one indicating school.

The coverage of basic human genetics and of ethics in genetics varied from teacher to teacher in this study. Only one teacher consistently covered ethical issues in the curriculum, while most teachers sometimes or rarely covered ethical issues. Teachers averaged 918 minutes per academic year covering genetics, and only 148 minutes per year covering ethical issues in genetics.

Conclusions

This study found that students lack knowledge of basic topics in modern human genetics, and thus supported the general consensus in the literature that genetics education does not focus enough on human genetics (Mertens & Hendrix, 1990). Since a strong background in human genetics is necessary to prepare students to make ethical decisions, one area which demands reform is the non-human Mendelian genetics curriculum of the local high schools. Mendelian genetics units do not familiarize students with human genetics. In this study, over one-half of the students had not heard of the Human Genome Project, although it will likely impact these students in the near future. These students will not be prepared to make ethical decisions, since only a human genetics curriculum can prepare students for the societal effects of genetic advancement.

Although the literature suggested that American high schools have little influence on students' ethical decision-making in genetics (Kormondy, 1990), this study found that the school had a significant impact on students' ethical views. Students cited school most often, as the greatest source of knowledge on ethical problems raised in genetics. This influence of school contrasted greatly with the teachers' reported low degree of coverage of ethical issues in the biology curriculum, and thus, brief coverage of ethics must have been sufficient to influence students.

In light of the school's important role in students' bioethical decision-making, educators may wish to reshape the genetics curriculum to ensure that it adequately addresses ethical issues. Deficient coverage of an issue may provoke students to rush into a particular ethical stance without carefully considering the pros and cons of their stance. Only if educators recognize the enormous influence of the school can they comprehend the importance of including significant coverage of ethical issues in the genetics curriculum. This study found that teachers do not perceive the school as an important influence on students' ethical decision-making. Such beliefs may lead to decreased emphasis on bioethics in the curriculum, since teachers may be less inclined to teach ethics in genetics when they think that such teaching will have a limited impact on students.

Although the school had the most significant impact on students' ethical decision-making in genetics, parents and media were also major influences. This trend could be significant to educators, since these outside sources are often biased against genetic applications and advancement. Educators may restructure the curriculum in order to off-balance such biases of media and parents. Furthermore, an increase in coverage of ethical issues in the genetics curriculum could further establish the school as the most important influence, despite the outside influence of parents and media.

The teacher has the important role of incorporating human genetics and ethical issues into the high school genetics curriculum, and in this study, teachers indicated low degrees of coverage of both human genetics and ethics. Teachers cited time constraints most often as the factor preventing them from covering more ethics (70%). Any restructuring of the curriculum to include more ethics in genetics will have to sacrifice coverage in other areas.

Overall, student deficiencies in basic human genetics knowledge and in bioethics experience must be addressed by educators. Furthermore, educators should recognize the important role that school plays in influencing ethical views, and at the same time, keep in mind that outside sources influence students' views. Genetics is progressing rapidly, and the accompanying ethical issues are becoming increasingly more significant. American secondary education can respond by restructuring the genetics curriculum into one that emphasizes human topics and bioethical considerations.

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